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SELECTED WATER RESOURCES ABSTRACTS

VOLUME 5, NUMBER 22
NOVEMBER 15, 1972

W72-13039 -- W72-13609

U.S. DEPARTMENT OF THE INTERIOR
OFFICE OF WATER RESOURCES RESEARCH
WATER RESOURCES SCIENTIFIC INFORMATION CENTER

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SELECTED
WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Resources Research, U.S. Department of the Interior

VOLUME 5, NUMBER 22
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Use of funds for printing this publication approved by the Director of the Bureau of the Budget, September 4, 1968.

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States—now and in the future.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Resources Research
U.S. Department of the Interior
Washington, D. C. 20240

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03 WATER SUPPLY AUGMENTATION AND CONSERVATION
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07 RESOURCES DATA
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08 ENGINEERING WORKS
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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

01. NATURE OF WATER

1B. Aqueous Solutions and Suspensions

DIFFUSIVITY OF BISULFIDE ION IN AQUEOUS SOLUTION,
Auburn Univ., Ala. Water Resources Research Inst.
R. H. Dinius, and L. C. Redding.
Available from the National Technical Information Service as PB-211 607, $3.00 in paper copy, $0.95 in microfiche. Bulletin 7, May 1972. 16 p, 3 tab, 23 ref. OWRR A-018-ALA (2).

Descriptors: *Diffusivity, *Activation energy, *Aqueous solutions, *Hydrogen sulfide, *Polarographic analysis, pH, Electrolyte, Temperature, Hydrogen ion concentration, Chemical analysis, *Ions.
Identifiers: *Bisulfide ions, *Sulfide ions.

The diffusivities and activation energy for the diffusion process of hydrogen sulfide, bisulfide ions and sulfide ions computed from the polarographic limiting currents are reported. The total sulfide was maintained constant in all measurements; pH, supporting electrolyte concentration and temperature were varied over a significant range. The diffusion coefficients and activation energy for diffusion of the bisulfide ion are plausible although smaller than one might expect. The diffusion coefficients and activation energies for diffusion of hydrogen sulfide and sulfide ion are anomalously low. A satisfactory explanation for these low values is not readily apparent.
W72-13292

02. WATER CYCLE

TURBULENT PRESSURE FLUCTUATIONS IN WATER WITH ADDITIVES,
Southampton Univ. (England). Dept. of Aeronautics and Astronautics.
A. Millward, and G. M. Lilly.
Available from the National Technical Information Service as AD-736 634, $3.00 in paper copy, $0.95 in microfiche. Southampton University Department of Aeronautics and Astronautics Report, 1971. 47 p, 16 fig, 27 ref, 2 append.

Descriptors: *Pipe flow, *Boundary layers, *Turbulent flow, *Pressure drag, *Additives, Polymers, Testing, Investigations, Reynolds number, Shear stress, Evaluation, Hydraulics.
Identifiers: Drag reduction, Turbulent pressure fluctuations.

The pressure fluctuations at the wall beneath a turbulent boundary layer were measured for various concentrations of dilute polymer solutions to determine the effect of the polymer on the structure of the flow and to provide an insight into the mechanism causing drag reduction in pipe flow. Measurements of the pressure fluctuations were made in a 2 in. diameter pipe at Reynolds numbers of approximately 350,000 with solution concentrations of 1/20/ppm of a polyethylene oxide (Polyox WSR 301) and 5-50/ppm of a polyacrylamide (Separan AP 30). The presence of the polymer molecules reduced the formation of the small eddies occurring in the region of the wall sublayer. From the reduction of drag in dilute polymer solutions there is also a reduction in the dissipation of energy from the flow. The mechanism of drag reduction is explained in terms of a branching process involving energy transfer to the polymer molecules at an energy level which is lower than that of viscous dissipation. (Woodard-USGS)
W72-13047

2A. General

THE HYDROLOGICAL ROLE OF FORESTS OF THE LITHUANIAN SSR,
For primary bibliographic entry see Field 04A.
W72-13158

PLEISTOCENE SEDIMENTOLOGY, CREDIT RIVER, SOUTHERN ONTARIO: A NEW COMPONENT OF THE BRAIDED RIVER MODEL,
McMaster Univ., Hamilton (Ontario). Dept. of Geology.
For primary bibliographic entry see Field 02J.
W72-13193

EFFECT OF WATER TABLE CONFIGURATION ON GROUND WATER FLOW FIELDS,
Tehran Polytechnic (Iran). Civil Engineering Inst.
For primary bibliographic entry see Field 02F.
W72-13198

LONG MEMORY MONTHLY STREAMFLOW SIMULATION BY A BROKEN LINE MODEL,
Instituto Geografico Nacional, Guatemala City; and San Carlos Univ. (Guatemala).
L. E. Garcia, D. R. Dawdy, and J. M. Mejia.
Water Resources Research, Vol 8, No 4, p 1100-1105, August 1972. 4 fig, 1 tab, 7 ref.

Descriptors: *Statistical models, *Markov processes, *Stochastic processes, Simulation analysis, Mathematical models, Model studies, Hydrograph analysis, Correlation analysis.
Identifiers: *Chixoy River (Guatemala), *Broken-line method (Statistical).

The Chixoy River in northern Guatemala exhibits a long-term dependence of monthly streamflows. A broken line model is developed to simulate the long-term dependence for the Chixoy River. The method for the determination of parameters for simulation is computationally easy. In addition, an algorithm is developed for preserving the memory of the historical streamflow record, which is operationally useful because if simulations of future streamflow are to be used for purposes of planning and design, such simulations should preserve a memory of the past, if long-term persistence is assumed to exist. The broken line model is shown to be a useful operational alternative to an autoregressive model. (Knapp-USGS)
W72-13459

RAINFALL-RUNOFF REGRESSION WITH LOGARITHMIC TRANSFORMS AND ZEROS IN THE DATA,
Bechtel Corp., San Francisco, Calif. Hydro and Community Facilities Div.
R. F. Kilmartin, and J. R. Peterson.
Water Resources Research, Vol 8, No 4, p 1096-1099, August 1972. 1 tab, 3 ref.

Descriptors: *Rainfall-runoff relationships, *Regression analysis, *Statistical methods, *Variability, Data processing, Streamflow forecasting, *California.
Identifiers: *San Lorenzo River (Calif).

When some zeros occur in a data matrix to be used in a log-log regression analysis, the data require the addition of a 'small increment' to make the transformation of the zeros feasible. If this increment is less than 1.0, the logarithm takes on negative values that, when they are squared, may have as much weight in the variance computations as the nonzero data, or more. The use of 1.0 as an increment is suggested, since log 1.0=0.0 and zero would have the desired weight of a null variate in both the variance computations and the regression relation. In a multilag rainfall-runoff regression for the San Lorenzo River at Big Trees, California, increments of 1.0 added to all variates resulted in significant improvements in the standard error of estimate and the coefficient of multiple determination in comparison to results with an increment of 0.001 added to only the zero variates. (Knapp-USGS)
W72-13460

MULTILAG MULTIVARIATE AUTOREGRESSIVE MODEL FOR THE GENERATION OF OPERATIONAL HYDROLOGY,
Natal Univ., Durban (South Africa). Dept. of Civil Engineering.
G. G. S. Pegram, and W. James.
Water Resources Research, Vol 8, No 4, p 1074-1076, August 1972. 7 ref.

Descriptors: *Systems analysis, *Statistical models, *Mathematical models, *Regression analysis, Markov processes, Stochastic processes, Surface-groundwater relationships, Rainfall-runoff relationships.
Identifiers: *Operational hydrology.

A model currently popular in the generation of operational hydrology is the lag 1 multivariate autoregressive process. In many cases this model adequately describes the combined streamflow of a region, but its extension to a multilag model may be useful since streamflow records have occasionally been found not to resemble realizations of simple Markov processes. All variables are treated as stationary and normally distributed with zero means. The groundwater recession curve of a hydrograph is usually assumed to be exponential in form, so that two different recession curves would form deterministic, mathematically independent sequences. The streamflow during a particular period is a fair indicator of the state of storage in the catchment. Most sequences of rainfall residuals appear to be serially uncorrelated although they may be highly interdependent. (Knapp-USGS)
W72-13464

WATERSHED PHYSICS: SOIL VARIABILITY CRITERIA,
Agricultural Research Service, Beltsville, Md. Hydrograph Lab.
A. S. Rogowski.
Water Resources Research, Vol 8, No 4, p 1015-1023, August 1972. 2 fig, 5 tab, 27 ref.

Descriptors: *Unsaturated flow, *Hydraulic conductivity, *Mathematical models, *Soil water movement, *Variability, Statistical methods, Statistical models, Saturated flow, Groundwater basins.
Identifiers: *Watershed physics.

Variability criteria were developed for input parameters to the moisture characteristic and hydraulic conductivity models. The parameters include the water contents at air entry and at 15 bars as well as the hydraulic conductivity used in matching the predicted values with the experimental values at saturation. The available data suggest that the water contents at 15 bars and at air entry have a normal distribution whereas the hydraulic conductivity has a log normal distribution. The distributions of water contents and conductivities for different soil series with depth and over an area are illustrated. In watershed studies a soil may be considered uniform with depth or over an area if the coefficient of variation with respect to water content does not exceed 15% at 15 bars and 10% at air entry and the logarithmic standard deviation for hydraulic conductivity is less than log 2. If these conditions are met, the water contents at 15 bars and at air entry as well as the saturated conductivities may be averaged. (Knapp-USGS)
W72-13471

CONCEPTUAL ANALYSIS OF RAINFALL AND RUNOFF DATA WITH A HYBRID COMPUTER,
Field Associates, Tucson, Ariz.
J. R. McCarthy.
Water Resources Research, Vol 8, No 4, p 942-955, August 1972. 18 fig, 3 tab, 18 ref.

Descriptors: *Rainfall-runoff relationships, *Computer models, *Hybrid computers, *Water balance, Hydrologic budget, Demonstration watersheds, Simulation analysis, Arid lands.
Identifiers: Atterbury Experimental Watershed (Ariz).

A watershed is represented by a serial multistage system in which each stage employs a generalized conceptual element. The stages are initial abstractions, surface storage, translation, intermediate abstractions, channel storage, final abstractions, and outlet storage. The specific character of each stage is determined by using data from an actual watershed and a hybrid computer. Data compiled from a 16-acre tract on the Atterbury Experimental Watershed near Tucson, Arizona, are used. A broad spectrum of recorded conditions gives rise to typical problems involving rainfall-runoff relations on arid land watersheds. Infiltration becomes the important initial abstraction, and Horton's equation is modified to make the capacity rate of infiltration a function of time and precipitation intensity. The analysis relates depression losses to storm variables so that the starting time of the runoff can be estimated. A provision is included for subsequent depression losses that may occur, for example, during multiple peak flows. The translation model developed permits the shifting of the computed hydrograph to coincide with the actual runoff. Linear reservoirs are used in storage stages. A suggested 'parameter matrix' increases the reliability of predictions. (Knapp-USGS)
W72-13477

STREAMFLOW SIMULATION: (1) A NEW LOOK AT MARKOVIAN MODELS, FRACTIONAL GAUSSIAN NOISE, AND CROSSING THEORY,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
I. Rodriguez-Iturbe, J. M. Mejia, and D. R. Dawdy.
Water Resources Research, Vol 8, No 4, p 921-930, August 1972. 2 fig, 30 ref.

Descriptors: *Statistical models, *Markov processes, *Stochastic processes, Simulation analysis, Mathematical models, Model studies, Hydrograph analysis, Correlation analysis.
Identifiers: *Broken-line method (Statistical).

Two different models are common in the hydrologic literature: the traditional Markovian or autoregressive type of model and the self-similar or fractional Gaussian noise (FGN) type of model. These two types of models are analyzed and a new approach for analyzing hydrologic time series is introduced. This new approach uses a different model that has advantages over Markovian or FGN models. The model preserves more properties of hydrologic interest more easily than the two other models. A broken line process is suggested as a potential hydrologic simulation model. The process is composed of the sum across a series of broken lines. By proper choice of the number of broken lines considered and of their parameters, various statistical characteristics may be modeled. These include an arbitrary monotonic correlation structure and memory. In addition, the second derivative of the correlation function at the origin may be preserved. This preservation of the second derivative is an important property in crossing theory. (See also W72-13479) (Knapp-USGS)
W72-13478

STREAMFLOW SIMULATION: 2. THE BROKEN LINE PROCESS AS A POTENTIAL MODEL FOR HYDROLOGIC SIMULATION,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
J. M. Mejia, I. Rodriquez-Iturbe, and D. R. Dawdy.
Water Resources Research, Vol 8, No 4, p 931-941, August 1972. 15 fig, 1 tab, 6 ref.

Descriptors: *Statistical models, *Markov processes, *Stochastic processes, Simulation analysis, Mathematical models, Model studies, Hydrograph analysis, Correlation analysis.
Identifiers: *Broken-line method (Statistical).

The broken line process, an alternative to Markovian and FGN processes, is suggested for hydrologic simulation. It is economical in parameters and can preserve an arbitrary set of statistical characteristics, including long memory and the Hurst phenomenon. (See also W72-13478) (Knapp-USGS)
W72-13479

RIPPLES ON UNDERSIDE OF RIVER ICE COVERS,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 02C.
W72-13573

STOCHASTIC FIVE DAILY STREAM FLOW MODEL,
Birmingham Univ. (England). Dept. of Civil Engineering.
N. T. Kottegoda.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 98, No HY9, Paper 9165, p 1469-1485, September 1972. 9 fig, 1 tab, 17 ref, 3 append.

Descriptors: *Stochastic processes, *Synthetic hydrology, *Streamflow forecasting, *Mathematical models, Probability, Correlation analysis, Simulation analysis, Regression analysis, Data collections.

A stochastic data-generating technique is applied to extend the records of British rivers. Because of the shortcomings in daily flow models, a 5-day time unit is adopted. An autoregressive process is more representative of the data than other short memory types. This is confirmed by tests on the synthesized data. For the series examined a fourth order process is adequate. The probability distributions of the independent residuals are confined to a limited range but different functions are necessary to fit individual series. Best fits are obtained by the Pearson Type III and Type IV and the lognormal distributions. The correlation structure is preserved in the generated data and other significant characteristics are similar to those in historical records. (Knapp-USGS)
W72-13575

SOIL MORPHOLOGY AND WATER TABLE RELATIONS: I. ANNUAL WATER TABLE FLUCTUATIONS,
Oregon State Univ., Corvallis. Dept. of Soil Science.
For primary bibliographic entry see Field 02G.
W72-13584

2B. Precipitation

EVALUATION OF POTENTIAL BENEFITS OF WEATHER MODIFICATION ON AGRICULTURE,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 03B.
W72-13053

HYGROSCOPIC SEEDING IN OKLAHOMA: VOLUMES I AND II,
Flight Test Research, Inc., Long Beach, Calif.
For primary bibliographic entry see Field 03B.
W72-13065

CAUSES OF TIDE-LEVEL FLUCTUATIONS IN ARCTIC SEAS (O FAKTORAKH, FORMIRUYUSHCHIKH SGONNO-NAGONNYYE KOLEBANIYA UROVNYA ARKTICHESKIKH MOREY),
Arkticheskii i Antarkticheskii Nauchno-Issledovatelskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02C.
W72-13068

SATELLITE CLIMATOLOGY,
For primary bibliographic entry see Field 07C.
W72-13274

SOME FEATURES IN THE DIURNAL VARIATIONS OF RAIN AND WIND OVER NORTH CAROLINA,
North Carolina Water Resources Research Inst., Raleigh.
W. J. Saucier.
Available from the National Technical Information Service as PB-211 614, $3.00 in paper copy, $0.95 in microfiche. Report No. 69, (Interim report 1), June 1972, UNC-WRRI-72-69, 49, 4 fig, 5 tab, 4 ref. OWRR-A-061-NC (1).

Descriptors: *Meteorological data, *Synoptic analysis, *Precipitation (Atmospheric), *Wind velocity, Air temperature, Weather data, *North Carolina, *Diurnal.

An exploratory study was made of the diurnal variations of precipitation occurrence and of surface wind speed from summaries of hourly observations during the decade 1951-1960 at airport stations in and neighboring North Carolina. Results are presented in the form of climatological probabilities of rainfall occurrence for each hourly period of the day in four months for nine sites in the region. Geographic patterns of these diurnal trends in hourly rain occurrence are given for the month of July in two categories of rainfall amounts during the hourly intervals, namely, measurable rain and quarter-inch rain. Significant geographic variations were found. Diurnal variations of surface wind speed are presented and analyzed for those four months at the coastal and piedmont stations. The most prominent feature resulting is the tendency for winds from south-southwest and those from north-northeast, the two modal directions for the region, to have radically different and in certain respects reversed diurnal trends of wind speed. This is evident inland and also at the marine location of Hatteras. These are related to diurnal changes in the temperature pattern of the atmosphere's boundary layer under the differing controls by the continental and marine surfaces.
W72-13302

PHYSICAL AND HYDROMETEOROLOGICAL CHARACTERISTICS OF THE SNOWY RANGE OBSERVATORY,
Wyoming Univ., Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 07C.
W72-13306

AN INVESTIGATION INTO THE EFFECT OF AN INDUSTRIAL HEAT AND MOISTURE SOURCE ON LOCAL ATMOSPHERIC CONDITIONS,
Naval Postgraduate School, Monterey, Calif.
For primary bibliographic entry see Field 05B.
W72-13313

RAINFALL-RUNOFF REGRESSION WITH LOGARITHMIC TRANSFORMS AND ZEROS IN THE DATA,
Bechtel Corp., San Francisco, Calif. Hydro and Community Facilities Div.
For primary bibliographic entry see Field 02A.
W72-13460

RAIN GAGE CATCH VARIATION DUE TO AIRFLOW DISTURBANCES AROUND A STANDARD RAIN GAGE,
Washington State Univ., Pullman. Dept. of Agricultural Engineering.
C. C. Mueller, and E. H. Kidder.
Water Resources Research, Vol 8, No 4, p 1077-1082, August 1972. 3 fig, 8 ref.

Descriptors: *Rain gages, *Calibrations, *Winds, Particle size, Raindrops, Velocity.

Although the spatial position has an important influence on the performance of a rain gage, the physical presence of the gage itself must be considered a hindrance to its operation. An obstruction to airflow in the vicinity of the gage, owing to the presence of the gage, results in disturbances in the local precipitation pattern in which the rainfall measurement is made. The airflow pattern data obtained in a study of a wind tunnel model and aerodynamic drag characteristics of water drops are used to perform a computer simulation on the movements of the drops as they approach the gage. These drop paths are analyzed to establish the effectiveness of the gage in measuring precipitation. If drops are 1-5 mm in diameter, the gage catches from 93% to 11% of the drops as the free stream velocity increases from 10 to 50 feet per second. In general, the decrease in catch is less pronounced as the drop size is increased. (Knapp-USGS)
W72-13463

2C. Snow, Ice, and Frost

ICE FORMED BEACH FEATURES FROM LAKE ST. JEAN, QUEBEC,
Centre de Recherche Forestiere des Laurentides, Quebec.
J. C. Dionne, and C. Laverdiere.
Canadian Journal of Earth Sciences, Vol 9, No 8, p 979-990, August 1972. 16 fig, 28 ref.

Descriptors: *Beaches, *Iced lakes, *Sedimentary structures, *Canada, Stratigraphy, Geomorphology, Beach erosion, Shores.
Identifiers: Lake St. Jean (Quebec).

Features characteristic of polar beaches, including ice-push ridges, ice-contact cusps, shore-ice kettles, residual marks left by melting ice, ice-rafted sediments, and wind features, occur on the beach at Val Jalbert, Lake St. Jean, Quebec. This example shows that the area covered by so-called 'polar beaches' is not restricted to the Arctic and Antarctic regions. Even though the preservation potential of ice-made figures and microrelief is considered low, such sedimentary features, if preserved in favorable circumstances, might aid in interpreting former depositional environments. (Knapp-USGS)
W72-13062

BIENNIAL CYCLE OF ICE FLUCTUATIONS (DVUKHLETNIY TSIKL V KOLEBANIYAKH LEDOVITOSTI),
Arkticheskii i Antarkticheskii Nauchno-Issledovatelskii Institut, Leningrad (USSR).
N. A. Volkov, and B. A. Sleptsov-Shevlevich.
Problemy Arktiki i Antarktiki, No 34, p 13-19, Leningrad, 1970. 2 fig, 3 tab, 7 ref.

Descriptors: *Oceanography, *Arctic Ocean, *Ice, *Cycles, *Fluctuations, Variability, Sampling, Probability.
Identifiers: *USSR, *Kara Sea, *Laptev Sea, *East Siberian Sea, *Chuckchee Sea, Biennial, Ice waves, Anomalies, Autocorrelation coefficients.

Investigations of spatial and temporal patterns of biennial waves in long-period ice fluctuations in arctic seas were based on data on the amount of ice in 7 arctic regions between the Barents and Chuckchee Seas for 10-day periods in July-September 1934-67. The regions examined were the southwestern and northeastern parts of the Kara Sea, the western and eastern parts of the Laptev Sea, the East Siberian Sea between longitudes 140-160 deg E and between 160-180 deg E, and the southwestern part of the Chuckchee Sea. On the basis of geographic distribution and nature of biennial ice fluctuations, the arctic can be divided into 3 principal regions: (1) the northeastern part of the Kara Sea and the western part of the Laptev Sea, gravitating toward the Atlantic; (2) the eastern part of the Laptev Sea, and the East Siberian Sea, adjoining the periphery of the Siberian anticyclone; and (3) the Chuckchee Sea, gravitating toward the Pacific. Distinct biennial ice fluctuations are observed in all arctic seas. Maximum biennial ice fluctuations are observed in the northeastern part of the Kara Sea and in the western part of the Laptev Sea. In the Chuckchee Sea, the amplitudes of ice fluctuations are high, while in the East Siberian Sea, the biennial fluctuations are small. Amplitudes of the biennial cycles in the Kara Sea reached 301,000 sq km and those in the Chuckchee Sea 53,000 sq km, which is 59% and 20%, respectively, of the areas of these seas. (Josefson-USGS)
W72-13067

CAUSES OF TIDE-LEVEL FLUCTUATIONS IN ARCTIC SEAS (O FAKTORAKH, FORMIRUYUSHCHIKH SGONNO-NAGONNYYE KOLEBANIYA UROVNYA ARKTICHESKIKH MOREY),
Arkticheskii i Antarkticheskii Nauchno-Issledovatelskii Institut, Leningrad (USSR).
N. V. Mustafin.
Problemy Arktiki i Antarktiki, No 34, p 5-12, Leningrad, 1970. 10 ref.

Descriptors: *Oceanography, *Arctic Ocean, *Tides, *Sea level, *Water level fluctuations, Currents (Water), Waves (Water), Surges, Winds, Wind tides, Atmospheric pressure, Ice, Streamflow, Shores, Coasts, Equations.
Identifiers: *USSR, *Kara Sea, *Laptev Sea, *East Siberian Sea, *Chuckchee Sea, Meteorological tides, Tide level, Drift ice, Fast ice.

Meteorological tides, caused by atmospheric factors, play the most important role in tide-level fluctuations of the Kara, Laptev, East Siberian, and Chuckchee Seas. The major causes of variations in sea level are wind, atmospheric pressure, waves, rotation of the earth, sea depth, bottom relief, and shoreline configuration. Drift ice has no significant effect on wind tides, while fast ice decreases the amplitude of sea level fluctuations. Equations are developed to describe the relationship between average monthly levels at a continental Arctic station and at an island station located approximately 100 km seaward. (Josefson-USGS)
W72-13068

WENDIAN GLACIATION OF EUROPE AND THE NORTH ATLANTIC IN THE LATE PRECAMBRIAN (VENDSKOYE OLEDENENIYE YEVROPY I SEVERNOY ATLANTIKI (VERKHNIY DOKEMBRIY)),
Akademiya Nauk SSSR, Moscow. Geologicheskii Institut.
N. M. Chumakov.
Akademiya Nauk SSSR Doklady, Vol 198, No 2, p 419-422, 1971. 2 fig, 19 ref.

Descriptors: *Glaciation, *Glaciers, *Glacial sediments, *Precambrian era, *Europe, Geographical regions, Till, Stratigraphy, Facies (Sedimentary), Age.
Identifiers: *USSR, *Scandinavia, *Tillites, Ice sheet, Periglacial.

The Lapland glacial horizon has been suggested as a new name for the European Wendian glacial sediments, underlying the basal trilobite-free beds of the Lower Cambrian and laid down some 650 million years ago. In northern Norway, eastern Greenland, the Middle Urals and, possibly, in Spitsbergen and parts of Sweden, the Lapland horizon can be divided into 3 parts: (1) a lower glacial subhorizon, which is most explicit in northern Norway; (2) an upper, Scandinavian glacial subhorizon; and (3) an interglacial Norwegian-Scandinavian subhorizon that separates them. On the Russian platform and in southern Norway, the Lapland horizon cannot be clearly differentiated. The Lapland glacial horizon is evidently widespread and may be related to the Tien Shan glacial horizon and to tillites in Asia, Australia, Africa, and Brazil. (Josefson-USGS)
W72-13071

ENGINEERING AND ECONOMIC IMPLICATIONS OF ICEBERGS IN THE NORTH ATLANTIC,
Memorial Univ. of Newfoundland, St. John's. Dept. of Engineering.
For primary bibliographic entry see Field 06B.
W72-13086

A STUDY OF SOME CHARACTERS OF METABOLISM OF SCOTCH PINE SEEDS DURING STORAGE IN SNOW,
For primary bibliographic entry see Field 02I.
W72-13154

THE APPLICATION OF THE AUGER HOLE METHOD IN HOLDERNESS GLACIAL DRIFT,
Hull Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 02F.
W72-13268

SATELLITE CLIMATOLOGY,
For primary bibliographic entry see Field 07C.
W72-13274

BIBLIOGRAPHY OF LITERATURE PERTINENT TO SNOWPACK MANAGEMENT,
Utah State Univ., Logan. Watershed Science Unit.
G. F. Gifford.
Utah State University College of Natural Resources Bibliography Series No 1, 1972. 22 p, 322 ref.

Descriptors: *Bibliographies, *Documentation, *Snowpacks, *Snow management, *Snow surveys, Information retrieval, Snowfall, Snow cover, Snowmelt, Hydrologic data, Meteorological data, Data collections.

This bibliography lists 322 items concerning snowpack properties and management. The list is alphabetized according to author. (Woodard-USGS)
W72-13279

HIGH LEAD CONCENTRATIONS IN COLUMBUS SNOW,
Ohio State Univ. Research Foundation, Columbus. Inst. of Polar Studies.
For primary bibliographic entry see Field 05A.
W72-13296

AN ANALYSIS OF THE DEMANDS FOR WATER FROM THE PRIVATE SECTOR IN A SUB-ARCTIC URBAN AREA,
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 06C.
W72-13298

PHYSICAL AND HYDROMETEOROLOGICAL CHARACTERISTICS OF THE SNOWY RANGE OBSERVATORY,
Wyoming Univ., Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 07C.
W72-13306

APPROXIMATE SOLUTION TO THE FREEZING OF THE ICE-WATER SYSTEM,
New Hampshire Univ., Durham. Dept. of Chemical Engineering.
S. D. Foss, and S. S. T. Fan.
Water Resources Research, Vol 8, No 4, p 1083-1086, August 1972. 2 fig, 8 ref.

Descriptors: *Freezing, *Ice, *Thermodynamics, *Kinematics, Cryology, Heat transfer, Ice-water interfaces.

A simplified solution to the Stefan problem for the ice-water system is presented. The solution is based on the assumption that the freezing process is the rate-controlling step and hence that the temperature of the solid phase is represented by a linear function of thickness. This solution is compared with the series solution of Westphal. The two solutions agree remarkably well for small Stefan numbers and deviate from one another for larger Stefan numbers. This comparison indicates that when the freezing process is the rate--controlling mechanism, the proposed simplified solution yields satisfactory results. (Knapp-USGS)
W72-13462

ULTRASONIC VELOCITIES OF THE DILATATIONAL AND SHEAR WAVES IN FROZEN SOILS,
Cold Regions Research and Engineering Lab., Hanover, N.H. Foundations and Materials Research Branch.
Y. Nakano, R. J. Martin, III, and M. Smith.
Water Resources Research, Vol 8, No 4, p 1024-1030, August 1972. 6 fig, 1 tab, 19 ref.

Descriptors: *Seismic studies, *Frozen soils, *Ultrasonics, *Permafrost, *Seismic properties, Soil physical properties, Geophysics, Travel time, Soil physics, Exploration, Mapping, Temperature, Hysteresis.
Identifiers: Seismic velocities.

Ultrasonic velocities of the dilatational and shear waves in water-saturated frozen soils were measured as a function of temperature by both pulse first arrival and critical angle methods. A strong correlation exists between the dilatational wave velocities and the unfrozen water content. The observed hysteresis in the velocities of silt and clay during a freeze-thaw cycle is considered to be caused by hysteresis in the frozen water content. A general tendency for the shear wave velocity to decrease with ascending temperature exists, but the effect of temperature is not as pronounced as on the dilatational velocity. Calculations based on measured dilatational and shear velocities showed that the Poisson's ratios of sand are almost constant. However, the ratios of silt and clay decrease monotonically with ascending temperature. (Knapp-USGS)
W72-13470

PREDICTION OF SPRING RUNOFF,
Minnesota Univ., St. Paul. Dept. of Soil Science.
For primary bibliographic entry see Field 02E.
W72-13474

COMPARISONS OF TWO ANTARCTIC LAKES WITH DIFFERENT TROPHIC STATES,
Virginia Polytechnic Inst. and State Univ., Blacksburg.
For primary bibliographic entry see Field 05C.
W72-13511

RIPPLES ON UNDERSIDE OF RIVER ICE COVERS,
Cold Regions Research and Engineering Lab., Hanover, N.H.
G. D. Ashton, and J. F. Kennedy.
Proceedings, American Society of Civil Engineers, Journal of the Hydraulics Division, Vol 98, No HY9, Paper 9191, p 1603-1624, September 1972. 14 fig, 1 tab, 14 ref, append. NSF Grant GK-17698 USACE DACW25-69-0098.

Descriptors: *Ice cover, *Ripple marks, *Freezing, *Ice-water interfaces, *Mathematical models, Melting, Heat balance, Heat flow, Convection, Heat transfer, Conduction, Turbulence, Cryology.
Identifiers: *River ice.

A mathematical model is developed to predict the occurrence and describe the properties and behavior of ice ripples that form on the underside of river ice-covers. The local rate of freezing or melting at the ice-flow interface is related to the difference between the local heat transfer rates by conduction through the ice and by turbulent transfer from the flow to the ice. The local heat flux to the interface from the flow is expressed as a small perturbation expansion in terms of the steepness of the monochromatic interfacial wave, and is assumed to be shifted relative to the interface wave. The analysis yields a stability criterion and expressions for the amplification rate and celerity of the ripples. Laboratory data are used to obtain values for the constants introduced into the theory and to corroborate the analytical results. Field data are examined in the light of the laboratory results. (Knapp-USGS)
W72-13573

SALT AND WATER MOVEMENT IN UNSATURATED FROZEN SOIL,
Agricultural Research Service, Kimberly, Idaho. Snake River Research Center.
For primary bibliographic entry see Field 02G.
W72-13579

MELTING OF SNOW COVER,
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
P. P. Kuz'min.
Israel Program for Scientific Translations, Jerusalem, 1972. 290 p, (TT 71-50095, Originally published by Gidrometeorologicheskoe Izdatel'stvo, Leningrad, 1961).

Descriptors: *Snow, *Snow cover, *Snowmelt, Snowpacks, Melt water, Runoff, Radiation, Temperature, Heat, Heat balance, Water balance, Water yield, Heating, Freezing, Meteorology, Topography, Seasonal, Forecasting, Analytical techniques, Instrumentation.
Identifiers: *USSR, Snow stakes, Heat exchange, Nomograms.

This monograph discusses the sources of heat which are necessary to melt snow and describes methods used to compute runoff from snowmelt. The analytical procedures developed are based on observations of various items in the energy and water balance and are designed for seasonal water-yield and rate-of-runoff forecasting. Intended primarily for hydrologists and meteorologists, the text will also prove useful to scientific workers in fields relating to the study and exploitation of snow cover in the national economy. (Josefson-USGS)
W72-13588

2D. Evaporation and Transpiration

REGULARITIES OF WATER EXCHANGE IN CORN UNDER OPTIMAL GROWING CONDITIONS,
Vsesoyuznyi Nauchno-Issledovatelskii Institut Kukuruzy, Dnepropetrovsk (USSR).
For primary bibliographic entry see Field 03F.
W72-13362

STUDIES ON MOISTURE CONDITIONS OF THE SOIL AND THE TRANSPIRATION OF CERTAIN PHYTOCENOSES OF THE BUCEGI MASSIF (CARPATHIANS),
C. Bindiu.
Rev Roum Biol Ser Bot, Vol 16, No 2, p 111-118, 1971, Illus, English summary.
Identifiers: *Soil moisture, *Forests, Abies G, Carpathians, Fagus D, Larix G, Phytocenoses, Pinus G, Romania, Soils, *Transpiration, *Bucegi massif.

The active moisture regime and the spatio-temporal variation of capillary potential (curve pF) are presented in the soils of 5 forest phytocenoses: Abieto-Fagetum dacicum, Abietum dacicum, Fagetum dacicum, Laricetum carpaticae and Pinetum carpaticum. The most favorable moisture conditions are in the Pinetum phytocenose; the least favorable in the Laricetum one. Larch, although having a higher average diurnal transpiration intensity (98-145 mg.g.-1 .h-1) to drought, has a great adaptation capacity. This explains the presence of the species in pure stands on superficial and strongly drained soils.--Copyright 1972, Biological Abstracts, Inc.
W72-13410

EVAPORATIVE COOLING OF A BODY OF WATER,
Zambia Univ., Lusaka. School of Engineering.
J. M. K. Dake.
Water Resources Research, Vol 8, No 4, p 1087-1091, August 1972. 1 tab, 9 ref.

Descriptors: *Evaporation, *Heat transfer, *Mass transfer, Humidity, Water temperature, Air temperature, Meteorology.

Known physical laws and empirical evaporation formulas are correlated to provide a simple means for estimating evaporative heat losses from water bodies. The result also provides an adjustment for atmospheric stability to established evaporation formulas. (Knapp-USGS)
W72-13461

A STOCHASTIC APPROACH TO THE STUDY OF EVAPORATION FROM LAKE ONTARIO,
Cornell Univ., Ithaca, N.Y.
S. L. Yu.
Available from University Microfilm, Ann Arbor, Michigan, Order No 69-7409, Microfilm $3.00, Xerox $7.60. Ph.D. Dissertation, September 1968. 161 p.

Descriptors: *Evaporation, *Lake Ontario, *Statistical methods, Mass transfer, Markov processes, Meteorological data, Water resources, Water temperature, Humidity, Wind velocity.
Identifiers: Air temperature, Water surface area.

Monthly mean values of evaporation from Lake Ontario were studied as a time series for the period 1872 to 1965 inclusive. The evaporation estimates were generated by a mass-transfer equation. The mass transfer coefficient was calculated by using Harbeck's equation relating the coefficient with water surface area. In order to obtain long-term values of water surface temperature for Lake Ontario, an estimation equation was developed based on statistical analyses of the relationship between observed water temperature, air temperature, wind speed, and sunshine percentage records. Correlation and spectral analyses were performed on both the raw data and the anomalies of evaporation and of the relevant meteorological parameters involved in the mass-transfer equation. High evaporation values were obtained for fall and winter months and low for early spring and summer months. On the average, maximum evaporation was observed for October and condensation for April. The average annual evapora-

tion was found to be 2.58 ft. A first order Markov model was found to adequately describe the evaporation, air temperature, and relative humidity anomalies, whereas a second order model could be used to fit the anomalies of wind speed and the water surface temperature. (Galwardi-Texas)
W72-13495

2E. Streamflow and Runoff

WATER RESOURCES OF WISCONSIN, CHIPPEWA RIVER BASIN,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-13046

GEOLOGY, HYDROLOGY, AND WATER QUALITY OF THE TRACY-DOS PALOS AREA, SAN JOAQUIN VALLEY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 02F.
W72-13051

WATER RESOURCES INVESTIGATIONS IN HAWAII AND OTHER PACIFIC AREAS, 1969.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-13061

INVESTIGATION TECHNIQUES OF HYDROGEODYNAMIC PROCESSES IN THE LAKE BAYKAL AND ANGARA RIVER BASINS (GIDROGEODINAMICHESKIYE PROTSESSY V BASSEYNE BAYKALA I ANGARY I METODY IKH ISSLEDOVANIYA).
For primary bibliographic entry see Field 02H.
W72-13069

A NOTE ON THE MEASUREMENT OF PLANAR VELOCITY FIELDS BY STEREO--PHOTOGRAMMETRY,
Southampton Univ. (England). Dept. of Civil Engineering.
R. Butterfield, R. M. Harkness, and K. Z. Andrawes.
Journal of Hydraulic Research, Vol 10, No 1, p 15-26, 1972. 6 fig, 5 ref.

Descriptors: *Photogrammetry, *Flow measurement, *Velocity, *Photography, Flow characteristics, Flow rates.
Identifiers: *Stereophotogrammetry.

Stereophotogrammetry can be used for measurement of planar velocity fields in fluids. The technique used was developed for the measurement of displacement and strain fields in granular materials in connection with work in soil mechanics, but it is equally applicable to any planar flow in which the plane of interest is either self-textured or can be artificially textured by neutral buoyancy markers. If a stationary camera is used to photograph a planar object which moves in plane between exposures, and these plates are viewed with a stereoscope, the object will appear to float in space relative to the static background at a height which is proportional to its displacement component parallel to a line joining the projector centers. Furthermore, if there is a whole field of small identifiable moving targets, the stereo images obtained will show a continuous 'hill and valley' landscape. Such topography can be contoured by conventional stereophotogrammetric procedures and the maps produced will show contours of the surface velocity components of the targets parallel to the eye base of the plotting machine. It should be noted that these contour diagrams contain the complete specification of the surface velocity field in component form. Consequently both the magnitude of the velocity and the streamline direction are immediately available at any point in the flow. (Knapp-USGS)
W72-13200

SOME ASPECTS OF ANALYZING TRANSVERSE DIFFUSION IN RIVERS,
Illinois Univ., Urbana. Dept. of Civil Engineering.
E. R. Holley, J. Siemons, and G. Abraham.
Journal of Hydraulic Research, Vol 10, No 1, p 27-57, 1972. 7 fig, 12 ref.

Descriptors: *Mixing, *Diffusion, *Dispersion, Streamflow, Path of pollutants, Channel morphology, Turbulence, Velocity.
Identifiers: *Transverse dispersion.

In hydraulic analyses, it is sometimes assumed that a single average velocity and average depth may be used to characterize flow in an irregularly shaped cross section. Many unknown aspects of the problem are then implicitly lumped into the diffusion coefficient. As many of the variables as possible should be correctly included in the analysis so it becomes clear what mechanisms the diffusion coefficient must represent. Some additional factors which previously might have been lumped into the diffusion coefficient are analyzed. In particular, consideration is given to the variation of depth, longitudinal velocity and diffusion coefficient within the cross section, and to transverse velocities. Numerical illustrations are used to show that all of these factors may be significant in diffusion problems. In particular, it is shown that transverse velocities in rivers may be cause rates of spreading which are of the same order of magnitude as that due to diffusion. A method was derived and illustrated to show how these various factors may be correctly considered in calculating diffusion coefficients from measured concentrations. Analytical solutions for a rectangular channel were used to estimate the longitudinal distance required for a tracer to cross a channel and then to become uniformly mixed with the flow. (Knapp-USGS)
W72-13202

WATER FOR INDUSTRIAL DEVELOPMENT IN KEMPER, LEAKE, NESHOBA, NOXUBEE, AND WINSTON COUNTIES, MISSISSIPPI,
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 03E.
W72-13278

SIMULATION MODEL FOR THE UPPER WABASH SURFACE WATER SYSTEM,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
For primary bibliographic entry see Field 04A.
W72-13301

HYDROLOGIC INFORMATION STORAGE AND RETRIEVAL SYSTEM (HISARS) REFERENCE MANUAL,
North Carolina Water Resources Research Inst., Raleigh.
For primary bibliographic entry see Field 07C.
W72-13308

PREDICTIONS OF TEMPERATURE IN STREAMS RECEIVING THERMAL DISCHARGES BY USING A DETERMINISTIC MODEL AND COMPUTER TECHNIQUE,
For primary bibliographic entry see Field 05B.
W72-13310

STREAM TEMPERATURE RESPONSE TO THERMAL POLLUTION,
Vanderbilt Univ., Nashville, Tenn. Dept. of Sanitary and Water Resources Engineering.
For primary bibliographic entry see Field 05B.
W72-13315

SOME PROPERTIES OF LINK MAGNITUDE FOR CHANNEL NETWORKS AND NETWORK PATTERNS,
Northwestern Univ., Evanston, Ill. Dept. of Geological Sciences.
M. F. Dacey.
Water Resources Research, Vol 8, No 4, p 1106-1111, August 1972. 10 ref.

Descriptors: *Drainage patterns (Geologic), *Geomorphology, *Topography, *Networks, *Probability, Mathematical models, Variability.
Identifiers: *Topology.

The generating function is given for the magnitude of a link randomly selected from the collection of topologically distinct channel networks of magnitude n and from the collection of topologically distinct network patterns of magnitude n. For large n, the link magnitude from both sample spaces has the inverse Polya distribution. An urn model underlying this distribution provides an intuitive explanation for the very long tail of the probability distribution of the link magnitude. (Knapp-USGS)
W72-13458

LONG MEMORY MONTHLY STREAMFLOW SIMULATION BY A BROKEN LINE MODEL,
Instituto Geografico Nacional, Guatemala City; and San Carlos Univ. (Guatemala).
For primary bibliographic entry see Field 02A.
W72-13459

RAINFALL-RUNOFF REGRESSION WITH LOGARITHMIC TRANSFORMS AND ZEROS IN THE DATA,
Bechtel Corp., San Francisco, Calif. Hydro and Community Facilities Div.
For primary bibliographic entry see Field 02A.
W72-13460

MULTILAG MULTIVARIATE AUTOREGRESSIVE MODEL FOR THE GENERATION OF OPERATIONAL HYDROLOGY,
Natal Univ., Durban (South Africa). Dept. of Civil Engineering.
For primary bibliographic entry see Field 02A.
W72-13464

PREDICTION OF SPRING RUNOFF,
Minnesota Univ., St. Paul. Dept. of Soil Science.
D. G. Baker.
Water Resources Research, Vol 8, No 4, p 966-972, August 1972. 4 fig, 3 tab, 11 ref.

Descriptors: *Runoff forecasting, *Frozen ground, *Snowmelt, *Rainfall-runoff relationships, Water balance, Infiltration, Evaporation, Snowpacks, Snow surveys, Thawing, *Minnesota, Overland flow, Streamflow forecasting.
Identifiers: Spring runoff.

A high correlation was found between the precipitation that fell when soils were frozen (defined as the 'cold period') and the early spring runoff in eight of 10 watersheds in southern and central Minnesota. The cold period precipitation thus becomes a useful tool in predicting early spring runoff amounts in those areas where soils freeze. Results also indicated that cold period precipitation can be entirely accounted for by runoff and sublimation (or evaporation). Additions to the soil water reserves need not be called on to satisfy an accounting of the disposal of the 'cold precipitation.' This runoff prediction method has the advantage of simplicity once the linear regression equation for a watershed is calculated. The method requires only the measurement of soil temperature and precipitation at one station in each watershed. (Knapp-USGS)
W72-13474

NEW CONCEPT IN HYDROGRAPH ANALYSIS,
Nebraska Univ., Omaha. Dept. of Civil Engineering.
W. F. Rogers.
Water Resources Research, Vol 8, No 4, p 973-981, August 1972. 2 fig, 1 tab, 11 ref.

Descriptors: *Hydrograph analysis, *Drainage patterns (Geologic), Peak discharge, Time of concentration, Unit hydrographs, Rainfall-runoff relationships.
Identifiers: *Channel length frequency.

Channel length frequency distribution is proposed as a parameter that has a qualitative relationship to the surface runoff hydrograph. Measurements of the distance from the basin outlet along the drainage channel to the head of each first order channel form a random distribution of distances. Frequency histograms of these distances, when compared with the surface runoff hydrograph from general storms, show consistent similarity. Some implications involving these similarities are that (1) first order channels are source areas of surface runoff, (2) concentrations of similar first order channel distances account for the hydrograph peak and secondary hydrograph peaks, (3) the timing of delivery of surface runoff to the outlet influences the hydrograph rise time and base width, (4) surface runoff occurs lower on the hydrograph recession limb than is generally assumed, (5) arbitrary base flow and interflow separation has questionable validity, (6) the distribution of first order channels in a drainage basin reflects the influence of geology on surface runoff, (7) channel length frequency distribution influences the distribution of unit volume runoff for unit hydrographs, and (8) channel length frequency distribution alone can account for variations in hydrograph peaks of otherwise homogeneous drainage basins. (Knapp-USGS)
W72-13475

IDENTIFICATION OF PARAMETERS IN UNSTEADY OPEN CHANNEL FLOWS,
California Univ., Los Angeles. Dept. of Engineering Systems.
L. Becker, and W. W-G. Yeh.
Water Resources Research, Vol 8, No 4, p 956-965, August 1972. 3 fig, 3 tab, 6 ref.

Descriptors: *Open channel flow, *Parametric hydrology, *Unsteady flow, *Numerical analysis, Mathematical models, Mathematical studies.
Identifiers: *Parameter identification.

The influence coefficient algorithm is a simple, easily implemented, and rapidly convergent computational procedure for identifying parameters in unsteady open channel flow. Identification is a mathematical process whereby the parameters embedded in a differential equation defining a system are determined from observations of system input and output. The parameters specifically chosen for identification are the two 'friction slope' characteristics: the channel roughness coefficient and the exponent of the hydraulic radius in the empirical friction slope relation, a number usually assumed to be 4/3. These parameters are not physically measureable and have to be determined from the solutions of the mathematical model using concurrent input and output measurements. This new procedure is related to both quasilinearization and on stability and convergence features related to the finite difference solutions of the governing flow equations. (Knapp-USGS)
W72-13476

CONCEPTUAL ANALYSIS OF RAINFALL AND RUNOFF DATA WITH A HYBRID COMPUTER,
Field Associates, Tucson, Ariz.
For primary bibliographic entry see Field 02A.
W72-13477

STREAMFLOW SIMULATION: (1) A NEW LOOK AT MARKOVIAN MODELS, FRACTIONAL GAUSSIAN NOISE, AND CROSSING THEORY,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02A.
W72-13478

STREAMFLOW SIMULATION: 2. THE BROKEN LINE PROCESS AS A POTENTIAL MODEL FOR HYDROLOGIC SIMULATION,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02A.
W72-13479

MEASUREMENT OF VELOCITY-CONCENTRATION COVARIANCE,
Geological Survey, Bay St. Louis, Miss.
For primary bibliographic entry see Field 05B.
W72-13574

STOCHASTIC FIVE DAILY STREAM FLOW MODEL,
Birmingham Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 02A.
W72-13575

2F. Groundwater

WATER RESOURCES OF WISCONSIN, CHIPPEWA RIVER BASIN,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-13046

GEOLOGY, HYDROLOGY, AND WATER QUALITY OF THE TRACY-DOS PALOS AREA, SAN JOAQUIN VALLEY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
W. R. Hotchkiss, and G. O. Balding.
Geological Survey Open-file Report, August 6, 1971. 107 p, 21 fig, 3 plate, 21 tab, 84 ref.

Descriptors: *Water resources development, *Hydrologic data, *Data collections, *California, Groundwater, Surface water, Aquifers, Hydrogeology, Water yield, Water quality, Water utilization, Water wells, Dumping, Irrigation, Water importing, Groundwater recharge, Overdraft, Groundwater movement, Streamflow, Chemical analysis.
Identifiers: *San Joaquin Valley (Calif), *Tracy-Dos Palos (Calif).

The Tracy-Dos Palos area (California) includes about 1,800 square miles on the northwest side of the San Joaquin Valley. The Tulare Formation of Pliocene and Pleistocene age, terrace deposits of Pleistocene age, and alluvium and flood-basin deposits of Pleistocene and Holocene age constitute the fresh groundwater reservoir. Pre-Tertiary and Tertiary sedimentary and crystalline rocks, undifferentiated, underlie the valley and yield saline water. Hydrologically most important, the Tulare Formation is divided into a lower water-bearing zone confined by the Corcoran Clay Member and an upper zone that is confined, semiconfined, and unconfined in different parts of the area. Lower zone wells were flowing in 1908, but subsequent irrigation development caused head declines and land subsidence. Overdraft in both zones ended in 1951 with import of surface water. Bicarbonate water flows into the area from the Sierra Nevada and Diablo Range. Diablo Range water is higher in sulfate, chloride, and dissolved solids. Upper zone water averages between 400 and 1,200 mg/liter dissolved solids and water hardness generally exceeds 180 mg/liter as calcium carbonate. Nitrate, fluoride, iron, and boron occur in excessive concentrations in water from some wells. Dissolved constituents in lower zone water generally are sodium chloride and sodium sulfate with higher dissolved solids concentration than water from the upper zone. (Woodard-USGS)
W72-13051

WATER RESOURCES INVESTIGATIONS IN HAWAII AND OTHER PACIFIC AREAS, 1969.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-13061

EXPLORATION OF MULTIPHASE FLUID FLOW IN A SALINE AQUIFER SYSTEM AFFECTED BY GEOTHERMAL HEATING,
Alabama Univ. Dept. of Civil and Mineral Engineering.
H. R. Henry, and J. B. Hilleke.
Alabama University Bureau of Engineering Research Report 150-118, July 1972. 105 p, 53 fig, 18 ref. USGS Contract 14-08-0001-12681.

Descriptors: *Groundwater movement, *Flow, *Saline water, *Geothermal studies, *Hydraulic models, Florida, Sea water, Aquifer characteristics, Data collections, Computer models, Theoretical analysis, Mathematical studies, Equations, Correlation analysis, Injection wells, Path of pollutants.
Identifiers: Coastal aquifers.

The effects of dispersion and geothermal heat upon flow, salinity, and temperature profiles in a coastal aquifer are described. The Floridan aquifer was modeled experimentally and mathematically to yield qualitative correlation with field data. Both dispersion and geothermal heating played a significant role in determining the position of the sea-water wedge and the strength of induced circulation in the salt-water zone. Also, a theoretical development serves as a base for predicting the direction that entrained waste might move after being injected into the Boulder Zone segment of the Floridan aquifer. The equations and method of solution are applicable to any aquifer, and not just for the field circumstances of Florida. (Woodard-USGS)
W72-13064

ELECTROMAGNETIC METHODS FOR MAPPING AND EVALUATING AQUIFERS,
California Univ., Berkeley. Water Resources Center.
F. H. Morrison.
Available from the National Technical Information Service as PB-211 646, $3.00 in paper copy, $0.95 in microfiche. Completion Report, UCAL-WRC-W-190, California Water Resources Center, Los Angeles, July 1972. 3 p, 2 ref. OWRR B-067-CAL (1).

Descriptors: Groundwater, *California, *Aquifer characteristics, Resistivity, *Subsurface mapping.
Identifiers: *Santa Clara Valley, Geophysical prospecting.

An electromagnetic depth sounding experiment with a horizontal loop carrying an oscillating current was carried out in Santa Clara Valley, California. The field data are interpreted in terms of the polarization parameters of the magnetic polarization ellipse. The chosen parameters are tilt-angle, ellipticity and the modulus of wave-tilt. The electrical discontinuities deduced are in general agreement with well data and with a geologic section based on resistivity soundings. The results clearly reveal an intermediate, highly resistive layer, which is a permeable stratum for groundwater recharge. It is concluded that a portable electromagnetic sounding system, measuring only tilt-angle and ellipticity, should easily locate highly resistive gravel deposits bounded by conductive clay

beds. It is theoretically obvious that the system is useful in those regions where it is extemely difficult to inject current into the ground.
W72-13182

EFFECT OF WATER TABLE CONFIGURATION ON GROUND WATER FLOW FIELDS,
Tehran Polytechnic (Iran) Civil Engineering Inst.
M. Shahbazi.
Journal of Hydraulic Research, Vol 10, No 1, p 93-111, 1972. 15 fig, 13 ref.

Descriptors: *Water table, *Groundwater movement, *Laplaces equation, *Flow nets, Recharge, Discharge (Water), Percolation, Mathematical models, Hydrogeology, Numerical analysis.

The Laplace equation was solved analytically in two-dimensional homogeneous, isotropic groundwater flow fields for different water-table configurations with the aid of least squares method. The flow pattern for different shapes of water-table configuration was obtained from a mathematical model. For the water-table configurations which have central symmetry relative to the intersection of the water-table curve and the mid-line of the basin, no matter what the slope, the transition point from recharge to discharge is half-way between the water divide and the valley bottom. For other water-table configurations, the transition point from the discharge zone to the recharge zone is not half-way between the water divide and valley bottom, but tends to occur closer to the lowest elevation. (Knapp-USGS)
W72-13198

FLOW UNDER A WEIR ON SOIL UNDERLAIN BY SLOPING IMPERVIOUS LAYER,
Indian Inst. of Science, Bangalore. Dept. of Civil and Hydraulic Engineering.
For primary bibliographic entry see Field 02G.
W72-13199

A NEW TECHNIQUE FOR TIME-VARIANT GROUND WATER FLOW ANALYSIS,
R. Herbert, and M. Zytynski.
Journal of Hydrology, Vol 16, No 2, p 77-92, June 1972. 13 fig, 6 ref.

Descriptors: *Groundwater movement, *Water level fluctuations, *Drawdown, *Simulation analysis, Drainage effects, Drainage systems, Mathematical models, Seepage, Withdrawal, Permeability, Numerical analysis, Computer programs.

A new numerical method is described which accurately simulates the time-variant movement of the water table in unconfined saturated strata. The method is suitable for use on a digital computer and requires far less storage space and computing time than alternative more complex techniques in regular present day use. The new technique is tested against well-proven alternative methods and proves to be accurate and convenient to use. The new technique is particularly suited to the analysis of the performance of groundwater lowering systems and a suite of programs has been developed based on the new method which has been successfully used as a design aid to many groundwater lowering schemes. (Knapp-USGS)
W72-13263

DEVELOPMENT OF GROUND WATER IN THE HOUSTON DISTRICT, TEXAS, 1966-69,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 03D.
W72-13264

ON THE HYDROGEOLOGY OF THE COASTAL REGION OF SOUTHEASTERN FINLAND,
Geological Survey of Finland, Otaniemi.
For primary bibliographic entry see Field 04B.
W72-13265

GROUND WATER IN SANTA BARBARA AND SOUTHERN SAN LUIS OBISPO COUNTIES CALIFORNIA, SPRING 1969 TO SPRING 1970,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 04B.
W72-13266

ANALYSIS OF A NETWORK-MODEL FOR DISPERSIVE FLOW,
Hebrew Univ., Jerusalem (Israel).
S. Mandel, and Z. Weinberger.
Journal of Hydrology, Vol 16, No 2, p 147-157, June 1972. 4 fig, 7 ref.

Descriptors: *Dispersion, *Porous media, *Groundwater movement, *Hydraulic models, Model studies, Mixing, Tracers, Path of pollutants, Mathematical models, Networks, Capillary conductivity.

The foundations of dispersion theory were re-examined by analyzing the flow of a tagged liquid through an irregular hexagonal lattice structure. For the model, anisotropy of the medium is subject to the condition that the direction of flow coincides with an axis of anisotropy. Eulerian analysis of the model yields the following results: (a) The variance of lateral dispersion is proportional to the distance measured in the direction of flow and to the geometry of the network (proportional to the square of mean cell-height and inversely proportional to mean cell-length). (b) The variance of longitudinal dispersion is proportional to distance measured in the direction of flow, proportional to the variance of the residence times of liquid in the elementary channels, and inversely proportional to mean cell-length. (Knapp-USGS)
W72-13267

THE APPLICATION OF THE AUGER HOLE METHOD IN HOLDERNESS GLACIAL DRIFT,
Hull Univ. (England). Dept. of Geography.
M. Bonell.
Journal of Hydrology, Vol 16, No 2, p 125-146, June 1972. 4 fig, 3 tab, 27 ref.

Descriptors: *Hydraulic conductivity, *Glacial drift, *Groundwater movement, *Aquifer tesing, Water yield, Boreholes, Piezometers, Withdrawal, Hydrogeology.
Identifiers: England.

The auger hole method was applied in Holderness glacial drift, England, to determine variations in hydraulic conductivity in the context of a shallow groundwater investigation in a small experimental catchment. The computational methods employed and some details of the practical problems encountered in field measurement are discussed. The results are used in the interpretation of hydrogeological, well hydrograph and drainage phenomena associated with the drift material. The calculated hydraulic conductivity values derived from the Kirkham and Van Bavel and Ernst formulae are compared. The Ernst approximate formula is sufficiently accurate for determination of conductivity within the limited range of pumping test geometries dealt with. (Knapp-USGS)
W72-13268

UNCONFINED AQUIFER AND SLOW DRAINAGE,
Birmingham Univ. (England). Dept. of Civil Engineering.
T. D. Streltsova.
Journal of Hydrology, Vol 16, No 2, p 117-134, June 1972. 6 ref.

Descriptors: *Groundwater movement, *Drawdown, *Water level fluctuations, *Theis equation, Storage coefficient, Water yield, Unsteady flow, Unsaturated flow, Hydrogeology.
Identifiers: *Unconfined aquifers.

One of the features of unsteady free surface flow is the phenomenon of slow draining of water-bearing materials. This phenomenon is usually identified and referred to as delayed yield from storage. By this is understood the slowing of the rate of lowering of the piezometric surface during the early period of pumping for the unsteady radial flow to a pumped well compared to the well-known nonequilibrium Theis theory. However, consideration of the nature of this phenomenon may show an identification to be inexpedient. The slow drainage observed in practice may also be considered as a delayed process of vertical transfer; there is no delayed yield. (Knapp-USGS)
W72-13269

PERTURBATION ANALYSIS OF THE EQUATION FOR THE TRANSPORT OF DISSOLVED SOLIDS THROUGH POROUS MEDIA: II. BASIC NON-LINEAR PROBLEM,
Wisconsin Univ., Madison. Dept. of Soil Science.
R. A. Wooding.
Journal of Hydrology, Vol 16, No 2, p 105-116, June 1972. 3 fig, 7 ref.

Descriptors: *Groundwater movement, *Mass transfer, *Ion transport, *Diffusion, *Mathematical studies, Translocation, Ion exchange, Equilibrium, Leaching, Chemical precipitation, Porous media, Adsorption.

Singular perturbation methods are used to treat analytically the problem of steady one-dimensional flow in a porous column, assuming nonlinear exchange equilibrium and concentration-dependent diffusivity, when the Peclet number is large. The breakdown of the original problem into a nonlinear outer problem, which is hyperbolic and of first order, and an inner problem which is equivalent to a set of ordinary differential equations, greatly facilitates analysis. The development and movement of concentration discontinuities within the flow is examined via the outer expansion, the first term of which neglects diffusion entirely. The next term gives a first estimate of diffusion effects. Material diffusing towards a discontinuity increases its speed. In the neighborhood of a disconuity, a state of quasi-equilibrium exists between diffusion and convective effects due to the relative velocity between the characteristics and the discontinuity. The first term of the inner expansion is matched both ahead of and behind the jump with the aid of only one arbitrary function of integration; the second function remains undetermined. At the next order, this function is evaluated as a shift of origin of the inner expansion to match the displacement of the jump due to diffusion. However, at this next order of matching, a new undetermined function appears. Extensions of the method to more general cases of nonlinear, nonequilibrium exchange, and when source terms are present, are discussed briefly. (Knapp-USGS)
W72-13270

MAJOR AQUIFERS IN CHARLES MIX AND DOUGLAS COUNTIES, SOUTH DAKOTA,
Geological Survey, Vermillion, S. Dak.
J. Kume.
South Dakota Geological Survey Information Pamphlet No 2, 1972. 2 p, 4 fig.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Hydrogeology, *Water supply, *South Dakota, Hydrologic data, Water wells, Water utilization, Groundwater movement, Water yield, Water quality, Water resources development.
Identifiers: *Charles Mix County (S Dak), *Douglas County (S Dak).

Groundwater sources in Charles Mix and Douglas Counties, South Dakota, include six major aquifers in unconsolidated deposits--the Choteau, Corsica, Geddes, Greenwood, Delmont, and

Tower aquifers. The unconsolidated deposits comprise preglacial stream sediments, glacial deposits, and postglacial alluvium. The Choteau aquifer is the largest; it underlies an area of 209,000 acres and contains about 2,200,000 acre-feet of water in transient storage. The Corsica, Geddes, Greenwood, Delmont, and Tower aquifers underlie a combined area of 138,000 acres, and contain about 1,300,000 acre-feet of water in transient storage. Groundwater in the unconsolidated deposits ranges in quality from fresh (water containing less than 1,000 milligrams per liter total solids) to slightly saline, and is generally very hard. Groundwater is used principally for domestic, stock, irrigation, and municipal water supplies. The Choteau aquifer is the most widely used of the aquifers in unconsolidated deposits. It supplies water to 13 irrigation wells, 5 public-supply wells, and about 300 stock and domestic wells. (Woodard-USGS)
W72-13272

DATA FROM CONTROLLED DRILLING PROGRAM IN DU PAGE, KANE, AND KENDALL COUNTIES, ILLINOIS.
Illinois State Geological Survey, Urbana.
For primary bibliographic entry see Field 04B.
W72-13275

WATER FOR INDUSTRIAL DEVELOPMENT IN KEMPER, LEAKE, NESHOBA, NOXUBEE, AND WINSTON COUNTIES, MISSISSIPPI,
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 03E.
W72-13278

GEOHYDRAULICS AT THE UNCONFORMITY BETWEEN BEDROCK AND ALLUVIAL AQUIFERS,
Colorado State Univ., Fort Collins. Environmental Resources Center.
J. P. Waltz, and D. K. Sunada.
Available from the National Technical Information Service as PB-211 664, $3.00 in paper copy, $0.95 in microfiche. Colorado Environmental Resources Center, Fort Collins Completion Report Series No 30, June 30, 1972. 169 p, 51 fig, 2 tab, 73 ref. OWRR B-022-COLO (1).

Descriptors: Groundwater management, *Groundwater movement, *Colorado, Geologic control, *Groundwater Basins, Hydrologic models, *Model studies, Hydrogeology, Darcys Law, Mass curves, *Base flow.
Identifiers: Bedrock-Alluvium contact, *Interbasin groundwater flux, Black Squirrel Basin, High Plains Basin, Kiowa Byon Basin.

Three legally designated groundwater basins in Colorado have been studied to determine the magnitude of groundwater flux into or out of the underlying bedrock. A numerical model based on Darcy's Law and the mass continuity equation was employed to describe the flow of groundwater within each basin. The model was applied to the analysis of interbasin groundwater flow by assuming that no leakage occurs at the base of the alluvial aquifer. Where leakage does occur, the model produces anomalous results in the form of erroneous water level elevations. The magnitude of the anomalies is used to calculate the rate of the interbasin groundwater flux. The model studies revealed the following interbasin groundwater fluxes: (1) Loss from Black Squirrel Basin is approximately 5,350 acre-feet/year. (2) Loss from High Plains Basin is approximately 75,000 acre-feet/year. (3) Gain to Kiowa-Bijou Basin is approximately 19,000 acre-feet/year. Data requirements for the application of the model to groundwater basin are presented and procedures for qualitative evaluation of interbasin groundwater flux are discussed.
W72-13352

SOURCE AREAS AND CLIMATIC EFFECTS IN CARBONATE GROUNDWATERS DETERMINED BY SATURATION INDICES AND CARBON DIOXIDE PRESSURES,
Pennsylvania State Univ., University Park. Dept. of Geosciences.
E. T. Shuster, and W. B. White.
Water Resources Research, Vol 8, No 4, p 1067-1073, August 1972. 8 fig, 1 tab, 8 ref.

Descriptors: *Water chemistry, *Karst hydrology, *Limestones, *Carbonate rocks, *Pennsylvania, Dolomite, Leaching, Carbon dioxide, Springs, Groundwater, Geochemistry, Karst, *Pennsylvania.
Identifiers: *Nittany valley (Pa).

In 14 carbonate springs in Nittany valley in central Pennsylvania, the feeder system for the springs can be characterized as conduit flow or diffuse flow on the basis of the variability in water chemistry. Saturation indices and CO2 partial pressures were sorted into monthly groups and averaged. Conduit springwaters are always aggressive with respect to both calcite and dolomite. The high variability reflects mostly variation in recharge, short residence time, and slow kinetics of equilibration between water and rock. Diffuse springwaters are somewhat aggressive with respect to calcite during the growing season but become somewhat supersaturated during the winter. Waters from diffuse-flow springs in dolomite are nearly at saturation, whereas waters from diffuse-flow springs in limestone are always undersaturated with respect to dolomite. The equilibrium CO2 pressures of conduit springwaters show a regular seasonal trend having a pronounced maximum during the growing season. The CO2 content of diffuse-flow springs is highly variable, and although the summer maximum is present, the CO2 content also reflects variations in the CO2 production in the catchment areas of infiltrating waters. (Knapp-USGS)
W72-13465

UNSTEADY RADIAL FLOW IN AN UNCONFINED AQUIFER,
Birmingham Univ. (England). Dept. of Civil Engineering.
T. D. Streltsova.
Water Resources Research, Vol 8, No 4, p 1059-1066, August 1972. 2 fig, 14 ref.

Descriptors: *Groundwater movement, *Drawdown, *Unsteady flow, *Water table, Equations, Saturated flow, Unsaturated flow, Storage, Permeability, Storage coefficient, Water level fluctuations, Numerical analysis.
Identifiers: *Unconfined aquifers.

Partial differential equations were written for unsteady radial flow to a well that is tapping an unconfined aquifer of infinite extent and discharging at a constant rate. Complete penetration of the aquifer by the well is assumed. Consideration is given to the observed head in a well that is screened throughout the unconfined aquifer, as well as to the head that corresponds to the free surface value. A relationship between the observed head and the free surface head is assumed to have the form of a vertical transfer linear equation. (Knapp-USGS)
W72-13466

DETERMINATION OF THE HYDRAULIC DIFFUSIVITY OF A HETEROGENEOUS CONFINING BED,
Geological Survey, Washington, D.C.
R. G. Wolff, and S. S. Papadopulos.
Water Resources Research, Vol 8, No 4, p 1051-1058, August 1972. 6 fig, 2 tab, 11 ref.

Descriptors: *Groundwater movement, *Diffusivity, *Aquicludes, *Aquitards, *Artesian aquifers, Permeability, Numerical analysis, Mathematical models, Piezometers, Groundwater, Confined water.
Identifiers: *Leaky artesian aquifers.

The hydraulic diffusivity of a confining bed exhibiting vertical heterogeneity was determined by field and laboratory tests. A thin sand aquifer was pumped, and head changes were observed in the aquifer and at three vertically separated piezometers in the overlying confining bed. A four-layer digital model was used to analyze the field data. Hydraulic diffusivities for each layer were adjusted in the model until calculated head changes in all piezometers closely matched those observed in the field. Laboratory-determined hydraulic diffusivities were several orders of magnitude smaller than the field-determined values. Interfingering of layers within the confining bed is believed to have caused this difference. Additional studies are needed before a general conclusion can be reached on the value of laboratory determinations of hydraulic parameters for heterogeneous confining beds. (Knapp-USGS)
W72-13467

NUMERICAL SIMULATION OF FLOW IN AN AQUIFER OVERLAIN BY A WATER TABLE AQUITARD,
Nevada Univ., Reno. Center for Water Resources Research.
R. L. Cooley.
Water Resources Research, Vol 8, No 4, p 1046-1050, August 1972. 1 fig, 9 ref.

Descriptors: *Groundwater movement, *Water table, *Compressibility, *Water level fluctuations, *Drawdown, Permeability, Storage coefficient, Numerical analysis, Unsaturated flow, Saturated flow, Mathematical models.
Identifiers: *Unconfined aquifers.

An extension of the convolution integral produced by 'delayed yield' theory describes vertical flow rate at the base of a unit such as an aquitard bounded at the top by a water table across which recharge is permitted and at the bottom by a variable drawdown boundary. The solution requires that the water table release water from storage instantaneously with a decline in head and that the compressibility of both the unit and the water in it be neglected. Application of the integral as an upper boundary condition for an aquifer underlying a water table aquitard allows approximation of the influence of the water table aquitard on the unsteady state head distribution in the aquifer. A simple, efficient procedure permits the use of a numerical approximation of the integral with a numerical groundwater flow model of the aquifer. An example solution demonstrates the high degree of accuracy of the method. (Knapp-USGS)
W72-13468

THEORY OF FLOW IN UNCONFINED AQUIFERS CONSIDERING DELAYED RESPONSE OF THE WATER TABLE,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel). Dept. of Soil and Water.
S. P. Neuman.
Water Resources Research, Vol 8, No 4, p 1031-1045, August 1972. 12 fig, 37 ref.

Descriptors: *Groundwater movement, *Water table, *Compressibility, *Water level fluctuations, *Drawdown, Permeability, Storage coefficient, Numerical analysis, Unsaturated flow, Saturated flow, Mathematical models.
Identifiers: *Unconfined aquifers.

A new analytical model is proposed for the delayed response process characterizing flow to a well in an unconfined aquifer. The present approach is based only on well-defined physical parameters of the aquifer system. Therefore it provides a possible physical explanation for the mechanism of delayed water table response. The process of delayed response in a homogeneous anisotropic phreatic aquifer can be simulated by using constant values of specific storage and

specific yield without recourse to unsaturated flow theory. In the absence of significant infiltration at the ground surface, compressibility may often be a much more important factor than unsaturated flow above the water table. (Knapp-USGS)
W72-13469

TEST-OBSERVATION WELL NEAR ODESSA, WASHINGTON: DESCRIPTION AND PRELIMINARY RESULTS,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 04B.
W72-13571

HELE-SHAW MODEL OF LONG ISLAND AQUIFER SYSTEM,
Southern Methodist Univ., Dallas, Tex. Inst. of Tech.
M. A. Collins, L. W. Gelhar, and J. L. Wilson, III.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 98, No HY9, Paper 9215, p 1701-1714, September 1972. 11 fig, 3 tab, 29 ref, append.

Descriptors: *Hydraulic models, *Hydrogeology, *Saline water instrusion, *Aquifers, *New York, Analog models, Water balance, Path of pollutants, Water table, Groundwater movement, Seepage, Saline water-freshwater interfaces, Saline water barriers.
Identifiers: *Hele-Shaw models.

An experimental study, using a vertical Hele-Shaw model, was undertaken to determine fresh and salt groundwater flow for various groundwater development schemes on Long Island, N. Y. To satisfy dynamic similitude, some portions of the model are anisotropic. To simulate stream base flow, an internal weir is incorporated in the model. Liquid silicones simulate fresh and salt water. Verification of the model is achieved by reproduction of long-term water table profiles, the stream base flow, and the double salt-water wedge structure (two salt-water wedges separated vertically by fresh water), south of the island. Response of the salt water to hydrologic transients on the island is slow. Recharge is effective in arresting or reversing salt-water movement. (Knapp-USGS)
W72-13578

GROUND-WATER RESOURCES OF BENSON AND PIERCE COUNTIES, NORTH-CENTRAL NORTH DAKOTA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-13587

SALINE KARST (SOLYANOY KARST),
For primary bibliographic entry see Field 02K.
W72-13590

A HYDROGEOLOGICAL ZONING OF THE AFRICAN CONTINENT (GIDROGEOLOGICHESKOYE RAYONIROVANIYE AFRIKANSKOGO MATERIKA),
Ye. A. Vostokova, N. A. Marinov, and L. I. Flerova.
Akademiya Nauk SSSR Izvestiya, Seriya Geologicheskaya, No 2, p 102-110, February 1972. 1 fig, 12 ref.

Descriptors: *Africa, *Hydrogeology, *Groundwater, *Groundwater basins, *Zoning, Geomorphology, Structural geology, Petrology, Orography, Hydrography, Meteorology, Artesian aquifers, Geologic mapping, Atlantic Ocean, Indian Ocean.
Identifiers: *USSR, *Mediterranean Sea, *Artesian basins, Tectonics.

The physiography, rock characteristics, and tectonic structure of the African continent are examined in connection with a division of the land mass into hydrogeological provinces and regions. Five hydrogeological provinces are identified: (1) the Atlantic Ocean drainage, covering 30% of the continent and consisting of 7 hydrogeological regions, including 20 artesian basins; (2) the Mediterranean Sea drainage, covering 15% of the continent and representing 3 hydrogeological regions, including 13 artesian basins; (3) the Indian Ocean drainage, covering 18% of the continent and divided into 4 hydrogeological regions, comprising 9 artesian basins; and (4) and (5) the continental interior and Rift plateau covering 31% of the continent and consisting of 8 hydrogeological regions and 27 artesian basins. A sketch map shows the hydrogeological zoning of the continent and the geographic occurrence of groundwater. (Josefson-USGS)
W72-13592

MIGRATION OF SPRINGS AND THEIR CHANGES AT DISCHARGE POINTS OF CARBONATED WATER AS ILLUSTRATED BY ARTESIAN SYSTEMS IN THE PAMIRS AND TIEN SHAN MOUNTAINS (MIGRATSIYA ISTOCHNIKOV I IZMENENIYA V OCHAGAKH RAZGRUZKI UGLEKISLYKH VOD PAMIRA I TYAN'-SHANYA KAK PRIMER GEODINAMIKI VODONAPORNYKH SISTEM),
Tsentralnyi Nauchno-Issledovatelskii Institut Kurortologii i Fizioterapii, Moscow (USSR).
V. N. Disler.
Akademiya Nauk SSSR Doklady, Vol 198, No 5, p 1167-1170, 1971. 1 tab, 3 ref.

Descriptors: *Hydrogeology, *Springs, *Spring water, *Confined water, *Artesian aquifers, Travertine, Water temperature, Water quality, Discharge (Water), Orography, Mountains, Volcanoes, Gases, Hydrothermal studies, Variability.
Identifiers: *USSR, *Pamirs, *Tien Shan, *Carbonated springs, Geodynamics, Diastrophism, Seismism, Tectogenesis, Orogeny.

The changes occurring within artesian systems of the Pamirs and Tien Shan Mountains in central Asia can be assessed from the type of travertine deposited near springs. Genetically, the different forms of travertine can be classified as (1) vein travertine, filling cavities in hydrothermal channels; (2) sheet travertine, formed near springs; and (3) travertine redeposited as a result of the disintegration of the first two types. In terms of the nature of travertine formation and scale of its deposition, two types of migration of carbonated springs can be identified: (1) migration without substantial change in composition and temperature of spring water, as illustrated by migration of the Garm Chashma Spring in the southwestern Pamirs; and (2) migration with a sharp change in composition and temperature of spring water, as provided by the Sang Khok Springs on the Gissar Range, 90 km from Dushanbe in Tadzhikistan. Continuing diastrophism, high seismic activity, and increasing intensity of tectogenesis are major factors in the alteration of artesian systems in the Pamirs and Tien Shan and markedly affect composition and temperature of spring water, pressure in artesian systems and fluid flow characteristics. (Josefson-USGS)
W72-13595

2G. Water in Soils

INTERACTION OF HERBICIDES AND SOIL MICROORGANISMS.
Boyce Thompson Inst. for Plant Research Inc., Yonkers, N.Y.
For primary bibliographic entry see Field 05C.
W72-13044

ROLE OF QUINONE GROUPS IN SOLUBILITY AND COMPLEXING OF METALS IN SEDIMENTS AND SOILS,
Bedford Inst., Dartmouth (Nova Scotia). Marine Geology Div.
For primary bibliographic entry see Field 05B.
W72-13059

CORRELATIVE RELATIONSHIPS BETWEEN INFILTRATION AND SOIL PROPERTIES (KORRELYATIVNYYE SVYAZI MEZHDU VELICHINOY ILFIL'TRATSII I SVOYSTVAMI POCHVENNOGO POKROVA),
Akademiya Nauk SSSR, Moscow. Institut Geografii.
A. M. Grin.
Akademiya Nauk SSSR Doklady, Vol 200, No 5, p 1207-1209, 1971. 1 tab, 6 ref.

Descriptors: *Correlation analysis, *Regression analysis, *Infiltration, *Infiltration rates, *Soil properties, Soil chemical properties, Soil physical properties, Soil density, Bulk density, Porosity, Aggregates, Organic matter, Variability, Equations, On-site investigations.
Identifiers: *European USSR, Multiple linear correlation, Curvilinear correlation, Correlation coefficients, Regression coefficients.

Investigations of quantitatively-determinate relationships between infiltration and soil properties were based on extensive experimental data for 27 places in steppe, forest-steppe, and southern forest zones in the European USSR and on American data for 68 places throughout the United States. On the basis of Soviet data, the correlation coefficient between rate of infiltration and organic-matter content in the upper 30 cm of soil reached 0.71, whereas the relationship between infiltration and bulk density was the same as that based on American data--minus 0.28. Introduction of additional variables does not necessarily improve the relationship. Close relationships exist between the infiltration rate and the principal soil physical and chemical properties, and the use of multiple linear correlation to find these relationships is justified. (Josefson-USGS)
W72-13070

COMPUTER SIMULATION ANALYSIS ON RECLAMATION OF SALT-AFFECTED SOILS IN SAN JOAQUIN VALLEY, CALIFORNIA,
California Univ., Davis.
For primary bibliographic entry see Field 03F.
W72-13115

VISIBLE AND NEAR INFRARED REMOTE--SENSING OF SOIL MOISTURE LEVELS,
Tennessee Univ., Knoxville.
For primary bibliographic entry see Field 07B.
W72-13130

FLOW UNDER A WEIR ON SOIL UNDERLAIN BY SLOPING IMPERVIOUS LAYER,
Indian Inst. of Science, Bangalore. Dept. of Civil and Hydraulic Engineering.
A. S. Reddy, G. C. Mishra, and K. Seetharamiah.
Journal of Hydraulic Research, Vol 10, No 1, p 77-91, 1972. 4 fig, 4 ref.

Descriptors: *Seepage, *Underseepage, *Numerical analysis, *Weirs, Porous media, Alluvial channels, Groundwater movement, Mathematical studies, Anisotropy, Leakage, Percolation.
Identifiers: Sheet piles.

Using the Schwarz-Christoffel transformation, an analysis is presented for finding the quantity of seepage, exit gradient and pressure distribution for a weir with an inclined sheet pile embedded in a homogeneous and isotropic porous medium underlain by an inclined impervious boundary. The inclination of the sheet pile has considerable in-

fluence on the quantity of seepage and exit gradient. The solution is useful for analysis of flow characteristics associated with a stepped weir having a vertical sheet pile in any anisotropic porous medium. (Knapp-USGS)
W72-13199

DETERMINATION OF CHANGES IN SOIL BULK DENSITY IN A RICE FIELD FOR ESTIMATION OF THE DESALINATION EFFECTS OF FLOODING (UCHET IZMENENIY OB'YEMNOGO VESA POCHVY RISOVOGO POLYA DLYA OTSENKI RASSOLYAYUSHCHEGO DEYSTVIYA ZATOPLENIYA),
Dagestanskii Nauchno-Issledovatelskii Institut Selskogo Khozyaistva, Makhachkala (USSR).
T. M. Gaziyeva, E. M. Mirzoyev, and S. F. Negovelov.
Pochvovedeniye, No 12, p 153-155, December 1971. 4 tab.

Descriptors: *Physical properties, *Bulk density, *Desalination, *Flood irrigation, *Rice, Salinity, Salts, Chlorides, Sulfates, Leaching, Variability, Sampling.
Identifiers: *USSR, *Dagestan ASSR, *Solonchaks.

The salt concentration in nonirrigated Solonchak in the Dagestan ASSR in May 1965 and in May 1969, four years after planting the field to rice, was investigated with and without accounting for changes in soil bulk density during flooding. The chloride content in 1969 was considerably reduced, while the sulfate content remained virtually unchanged. As a result of leaching of chlorides, the salinity level in the soil in 1969 decreased by 30%. Depending on computation techniques used, estimates of the effectiveness of desalination vary widely. (Josefson-USGS)
W72-13280

WATER PROPERTIES OF SOME SOILS IN THE TURKMEN SSR (O VODNYKH SVOYSTVAKH NEKOTORYKH POCHV I GRUNTOV TURKMENSKOY SSR),
Turkmenskii Gosudarstvennyi Pedagogicheskii Institut, Chardzhou (USSR).
O. Allakov, and Kh. Baydzhanov.
Pochvovedeniye, No 12, p 141-145, December 1971. 2 fig, 1 tab, 10 ref.

Descriptors: *Thermodynamics, *Physicochemical properties, *Water properties, *Soils, Sands, Clay loam, Clays, Bentonite, Soil density, Soil moisture, Moisture content, Hysteresis, Sorption, Adsorption, Humidity, Equations.
Identifiers: *USSR, *Turkmen SSR, *Heat of wetting, *Specific surface, Hygroscopicity, Desorption, Isotherms.

Physicochemical properties of sand, soil, clay loam, clay and bentonite in the Turkmen SSR were investigated for sorption and desorption isotherms, water-holding properties, heat of wetting, and density. S-shaped isotherms with a clearly expressed sorption hysteresis were obtained for the samples examined. For Oglanly bentonite and Kalinin and Kelyatinskaya clays, sorption hysteresis begins at a relative humidity of 10%. For soil of the Chardzhou agricultural experiment station, sorption hysteresis begins at a relative humidity of 40%-45% and for Bezmein clay loam and sand from the Kara Kum Desert it begins at 40% and 53%, respectively. Depending on the type of clay mineral in the colloidal fraction of soil material, specific-surface values obtained from heat of wetting and from a proposed equation vary between 12 sq m/liter for Kara Kum sand and 355 sq m/liter for Oglanly bentonite. Specific surface, heat of wetting, and water-holding properties of soil materials of different mineral composition differ significantly, depending on structural and geometric characteristics, degree of dispersion, and physicochemical nature of the solid-particle surface. (Josefson-USGS)
W72-13281

SOIL-RECLAMATION STUDIES IN THE POLISH PEOPLE'S REPUBLIC (POCHVENNO-MELIORATIVNYYE ISSLEDOVANIYA V POL'SKOY NARODNOY RESPUBLIKE),
For primary bibliographic entry see Field 04A
W72-13282

DYNAMICS OF WATER-SOLUBLE SALTS UNDER ALFALFA IN A RICE CROP ROTATION (DINAMIKA VODNORASTVORIMYKH SOLEY POD LYUTSERNOY V RISOVOM SEVOOBOROTE),
For primary bibliographic entry see Field 03C.
W72-13284

CONTENT OF TOXIC SALTS IN WATER EXTRACTS AND SOIL SOLUTIONS OF GYPSUM-BEARING SOILS IN THE GOLODNAYA STEPPE (SODERZHANIYE TOKSICHNYKH SOLEY V VODNYKH VYTYAZHKAKH I V POCHVENNYKH RASTVORAKH GIPSONOSNYKH POCHV GOLODNOY STEPI),
Akademiya Nauk SSSR, Moscow. Pochvennyi Institut.
V. S. Muratova, and V. Yu. Margulis.
Pochvovedeniye, No 12, p 87-99, December 1971. 2 fig, 6 tab, 21 ref.

Descriptors: *Water chemistry, *Aqueous solutions, *Saline soils, *Salts, *Gypsum, Sulfates, Chlorides, Ions, Moisture content, Soil moisture, Hygroscopic water, Field capacity, Soil profiles, Soil texture, Soil types, Sierozems, Salt tolerance, Land management, Regression analysis.
Identifiers: *USSR, *Kazakhstan, *Golodnaya Steppe, *Solonchaks, *Meadow soils, Soil samples, Soil solutions, Magnesium sulfate.

To determine the concentration of toxic salts in water extracts and soil solutions, 100 samples were taken from 8 profiles of saline, gypsum-bearing Sierozem-Meadow soils and Meadow-Mineral Solonchaks and 47 samples from 6 profiles of irrigated Light Sierozems in the southern part of the Golodnaya Steppe in southeast Kazakhstan. The content of toxic salts in water extracts always exceeds that in soil solutions, being 1-2 meq/100 g of soil higher in irrigated Light Sierozems having no visible gypsum accumulation and 3-5 meq/100 g of soil higher in gypsum-bearing Sierozem-Meadow soils. An excess concentration of 1-2 meq of sodium and magnesium sulfates in a water extract of a slightly saline gypsum-bearing soil corresponds to an increase of 0.06%-0.12% in the amount of toxic salts. The concentration of these salts in soil solutions can be determined from their concentration in water extracts with a maximum error of 2-3 g/liter for slightly saline soils, 5-7 g/liter for moderately and strongly saline soils, and 10-12 g/liter for Solonchaks. Salt-affected soils can be classified according to content of toxic salts in water extracts, provided the composition of water extracts and soil solutions are compared in terms of the effects of solution concentration on crop growth. (Josefson-USGS)
W72-13285

STABILITY OF WET AGGREGATES IN AN ARTIFICIAL SOIL STRUCTURE (DINAMIKA VODOPROCHNOSTI I MEKHANICHESKOY PROCHNOSTI ISKUSSTVENNOY STRUKTURY POCHV),
Agrofizicheskii Nauchno-Issledovatelskii Institut, Leningrad (USSR).
B. I. Potapov.
Pochvovedeniye, No 12, p 79-86, December 1971. 2 fig, 2 tab, 17 ref.

Descriptors: *Soil physics, *Soil structure, *Soil aggregates, *Soil stability, *Soil strength, Shear strength, Bulk density, Soil moisture, Moisture content, Porosity, Pores, Polymers, Aqueous solutions, Soil analysis, Analytical techniques, Weather forecasting.
Identifiers: *USSR, *Soil samples, *Aggregation, Macroaggregates, Microaggregates, Sod-Podzolic soils, Polyacrylamide.

Analysis of the effects of soil moisture content on stability of wet aggregates in a soil macrostructure was based on a laboratory study of the interaction between Sod-Podzolic clay loam soil and polyacrylamide (PAA). Structure-forming polymers considerably improve the stability, strength, and porosity of soils and are effective when the newly formed macrostructure is dried and when it is kept at a high moisture content. A PAA solution can be used in a wide range of soil moisture contents prior to application. Since stability and strength of macroaggregates formed in the presence of PAA increase with time, short-range weather forecasts must be consulted before applying the structure-building polymer. When structure-forming polymer solutions are used, allowance must be made for the original soil moisture content and its change after aggregation to obtain the highest possible aggregating effect. At a constant soil moisture content, the strength of macroaggregates formed was high on the 5th and 7th day after addition of the PAA solution to the soil. (Josefson-USGS)
W72-13286

CONTROLLING WATER INFILTRATION IN BIMODAL POROUS SOILS: AIR-EARTH INTERFACE CONCEPT,
Agricultural Research Service, Reno, Nev.
R. M. Dixon.
In: International Association for Hydraulic Research and International Society of Soil Science, Proceedings of Second Symposium, Vol 1, p 102-117, August 1972.

Descriptors: *Air-earth interfaces, *Infiltration, *Soil water movement, *Porous media, Hydrologic properties, Soil surfaces, Pores, Hydraulic conductivity, Soil management, Watershed management, Cultivation, Mulching.
Identifiers: *Infiltration control, *Cultural practice design, Bimodal porous media, Macropores, Surface geometry, Surface cover, Soil air pressure, Soil air movement.

The air-earth interface concept sets forth the general principle that soil surface roughness and openness govern the flow of air and water in underlying macropore and micropore systems and thereby control infiltration of free surface water. If the soil surface is rough and open, interfacial exchange of air and water occurs freely and water infiltrates rapidly via the relatively short broad straight paths of the macropore system. In contrast if the surface is smooth and closed, surface exchange of air and water is greatly impeded and water infiltrates slowly via the relatively long narrow tortuous paths of the micropore system. To achieve a desirable rate and route of infiltration, cultural practices can be directed to creating appropriate levels of interfacial openness and roughness. These levels may be attained directly and quickly by using suitable tillage implements or indirectly and more slowly by guiding natural physical and biological processes. (ARS)
W72-13289

WATER INTAKE RATES ON A SILT LOAM SOIL WITH VARIOUS MANURE APPLICATIONS,
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 03F.
W72-13295

WATER TABLE CONTROL AND SUBSURFACE IRRIGATION IN MINERAL AND HIGH ORGANIC COASTAL PLAIN SOILS,
North Carolina Water Resources Research Inst., Raleigh.
For primary bibliographic entry see Field 03F.
W72-13304

THE REDOX PROPERTIES OF SOLUTIONS IN PODZOLIC SOILS BY LYSIMETRIC DATA,
E. I. Shilova, and L. V. Kozlova.
Uch Zap Leningr Gos Univ. 348. p 164-173. 1969.
Identifiers: *Oxidation-reduction potential, Deficit, Forests, Grass M, Loam, Lysimetry, Oxygen, *Podzols, Soils, Solutions.

Soil solutions in the humus horizon contain less O2 and more ferrous-Fe and have smaller rH2 than in the podzol and illuvial horizons. The redox equilibrium of solutions in loamy soils is shifted more toward reducing conditions than in sandy soils. The O2 deficit in the solutions from loamy forest soils is usually most acute in summer and autumn, but has been noted in spring and summer under grasses.--Copyright 1972, Biological Abstracts, Inc.
W72-13367

CERTAIN TRAITS OF MOUNTAIN SOILS IN RELATION TO THE NATURAL ENVIRONMENT,
V. G. Kalmykova.
Izv Vses Geogr O-Va. Vol 102, No 2, p 124-128. 1970.
Identifiers: *Mountains, *Soil types, Environmental effects, Climate, Cover, Environment, Formation, Plants, Runoff, Salinity, Soils, Surface.

Mountain soil formation is controlled by the composition and properties of the soil-forming rocks; mountain soils are usually young, shallow, and physical weathering is pronounced. Examples of dissimilar soils in the Urals formed on different soil-forming rocks under very similar climatic conditions and plant covers are given. All mountain soils have high humus contents, increasing with elevation, and coarse humus. A predominance of surface runoff over seepage diminishes the salinity of mountain soils and retards processes of podzolization and bogging. The names of mountain soils should include a designation of the vertical plant zone and place of occurrence.--Copyright 1972, Biological Abstracts, Inc.
W72-13368

SOILS IN THE FLOODPLAIN OF THE AMUR RIVER WITHIN THE UDYL-KIZINSKAYA LOWLAND,
Y. I. Ershov.
Khabar Kompleksn Nauchno-Issled Inst Sib Otd Akad Nauk SSSR. 107 p. Khabarovsk. 1969.
Identifiers: *Soil properties, *Flood plains, Agriculture, Classification, Genesis, Udyl-Kizinskaya, Amur River, Soils, USSR.

The conditions of soil formation, the classification, genesis and evolution of the soils are described. The results of determination of various physicochemical properties and the possibilities of agricultural utilization of floodplain soils are presented.--Copyright 1972, Biological Abstracts, Inc.
W72-13372

TECHNIQUE OF SOIL STUDY OF THE ROUTES OF MOVEMENT OF LIQUID MOISTURE IN THE SOIL,
Mescow State Univ. (USSR). Dept. of Soil Physics and Reclamation.
E. A. Dmitriev.
Biol Nauk. Vol 14, No 5, p 125-127. 1971. Illus.
Identifiers: *Soil water movement, *Soil investigations, Analytical techniques, Filtration, Iodine, Liquids, Moisture, Movement, Routes, Soils, Starch.

A 1-2.5% solution of soluble starch may be used to determine the routes of liquid moisture in the soil. A section of soil soaked in solution was sprayed with I water. The route of the filtration of the starch was found by the appearance of dark spots in the soil section.--Copyright 1972, Biological Abstracts, Inc.
W72-13373

CONTROLLING PRACTICES FOR WATER REGIME OF SANDY SOILS,
For primary bibliographic entry see Field 03F.
W72-13375

CERTAIN PROPERTIES OF SANDY AND SANDY LOAMY SOILS IN THE MESHCHERA LOWLAND ON BINARY DEPOSITS AND THEIR AGRICULTURAL VALUE,
For primary bibliographic entry see Field 03F.
W72-13377

WIND EROSION IN UZBEKISTAN AND SOME METHODS FOR ITS PREVENTION,
K. Mirzazhanov.
(Tr) Vses Nauchno-Issled Inst Khlopkovod. 16. p 237-253. 1970.
Identifiers: *Erosion control, *Wind erosion, Bogs, Cotton D, Erosion, Meadows, Soils, Soil texture, USSR, Uzbekistan, Soil chemical properties.

Erosion affects meadow saz (habitat with high and permanent water table in arid regions of Central Asia), bog meadow soils of various salinities, silted soils and solonchaks. Data are given on the texture and chemical composition of uneroded and eroded meadow saz soil, wind velocity over a vertical profile, quantity and composition of deflation products. Ninety-nine percent of the total transported matter is in the surface portion of wind flow, 0-1 m above the ground. Deflation occurs more readily from saline horizons. Soils are also drifted over by sand from the sand massifs of central Fergana. Data are given on the effect of wind erosion and mechanical protection upon the cotton yields. A testing system of erosion control measures is proposed.--Copyright 1972, Biological Abstracts, Inc.
W72-13378

MOISTURE TURNOVER WITHIN SEROZEMS AND CINNAMON SOILS,
E. N. Blagoveshchenskii.
Tr Nauchno-Issled Inst Pochvoved Tadzh SSR. Vol 13, No 1, p 176-194. 1969.
Identifiers: *Soil moisture, *Moisture content, Accumulation, Cinnamon soils, Gradients, Migration, Moisture, Serozems, Soils, Temperature, Trees.

Experiments were conducted in the Lyaur-Dangara and Tavil-Dara areas of the Tadzhik SSR, in 1962-1966. The maximum moisture turnover occurred in exposed soil monoliths, the minimum in those covered on top, while those covered at the bottom occupied an intermediate position. The highest moisture content (12.4%) in serozem occurred in the soil monolith covered at the bottom, and the lowest in the exposed soil monolith. The highest moisture content in the cinnamon soil occurred in the soil monolith covered at the bottom (18.8%), the lowest (15.1%) in the soil monolith covered on top, while the exposed soil monolith occupied an intermediate position in this respect. The observation methods are described. The soil moisture regime was determined not only by the precipitation regime, but also by the thermal regime in the soil. The downward migration of moisture actuated by the temperature gradient during the warm season revealed that large moisture accumulation was due to an insulating intercalation placed at a depth of 2 m. The strongest effect was achieved by inserting a water-impermeable material on top and another at the bottom, the former in the rows below the roots and the latter in the interrows. This practice is applicable to tree stands.--Copyright 1972, Biological Abstracts, Inc.
W72-13381

INFILTRATION PROPERTIES OF SOILS ON THE NORTHERN SLOPE OF TRANSILI ALA-TAU AND THE EFFECT OF MAN'S ECONOMIC ACTIVITIES,
V. P. Mochalov.
Sb Statei Aspir Soiskatelei Min Vyssh Srednego Spets Obraz Kaz SSR Biol Geogr. 4. p 157-161. 1968.
Identifiers: Agriculture, Annual, *Soil conservation, Cover, Economics, *Infiltration, Plants, Regeneration, Slopes, Soils, Trans-Ili, Ala-Tau, USSR.

The infiltration properties of soils were assessed from their infiltration parameter, characterizing the maximum possible infiltration. This parameter was reduced by a factor of 2-10 by man's activities. Measures are recommended for conservation of the soil cover and annual regeneration of the plant cover. Suspension of plowing and grazing is recommended for steep mountain slopes. It is suggested that the territory be utilized under orchards, vineyards, and hayfields, and irrigated by sprinkling when necessary.--Copyright 1972, Biological Abstracts, Inc.
W72-13383

REGULARITIES OF THE DYNAMICS OF SOIL MOISTURE RESERVES IN THE SOUTHERN UKRAINE,
A. V. Shvebs.
Meteorol Klimatol Gidrol Mezhved Nauchn Sb. 5. p 132-135. 1969. English summary.
Identifiers: *Soil moisture, Accumulation, Curves, Dynamics, *Moisture content, Reserves, Soils, Southern Ukraine, USSR.

Analysis of moisture accumulation curves for the soil reveals that 10-day precipitation totals of 5-15 mm do not increase the soil moisture content. The position of these curves is determined by the limit of possible moisture accumulation and is practically independent of the development phase of the crop. Concurrently constructed curves of the loss and the accumulation of soil moisture may be used for calculation and prediction of soil moisture reserves for individual farms.--Copyright 1972, Biological Abstracts, Inc.
W72-13384

STUDIES ON MINERALIZATION OF UREA IN SOME SOILS OF MYSORE STATE,
University of Agricultural Sciences, Bangalore (India). Microbiology Dept.
For primary bibliographic entry see Field 05B.
W72-13385

SOILS OF THE GLENAVY-WILLOWBRIDGE DISTRICT, SOUTH CANTERBURY, NEW ZEALAND, AND THEIR SUITABILITY FOR IRRIGATION,
Department of Scientific and Industrial Research, Christchurch (New Zealand). Soil Bureau.
E. Griffiths.
N Z J Sci. Vol 14, No 3, p 524-553. 1971. Illus. Map.
Identifiers: Age, Drainage, *Irrigation, New Zealand, *Soils, Topography, South Canterbury (N.Z).

The soils are described and grouped according to parent material, age, and ground-surface. The soils, topography, and drainage are considered. Relic Fe cemented pans occur in the Steward and

Lismore soils, but as these soils are of limited areal extent the pans should not interfere with drainage of the whole area. Seventy percent of the soils are suitable for irrigation.--Copyright 1972, Biological Abstracts, Inc.
W72-13386

EFFECT OF SOIL TYPE AND IRRIGATION METHOD ON LATERAL MOVEMENT OF CYCLOATE,
Oregon State Univ., Corvallis. Dept. of Farm Crops.
For primary bibliographic entry see Field 05B.
W72-13388

RESIDUAL ACTIVITY OF PARAQUAT IN SOILS: II. ADSORPTION AND DESORPTION,
Ontario Agricultural Coll., Guelph.
For primary bibliographic entry see Field 05B.
W72-13409

DEGRADATION OF BROMOXYNIL IN REGINA HEAVY CLAY,
Department of Agriculture, Saskatoon (Saskatchewan); and Regina Research Station (Saskatchewan).
For primary bibliographic entry see Field 05B.
W72-13411

THE INFLUENCE OF LIQUID SURFACE TENSION AND LIQUID-SOLID CONTACT ANGLE ON LIQUID ENTRY INTO POROUS MEDIA,
California Univ., Riverside. Dept. of Soils and Plant Nutrition.
C. L. Watson, J. Letey, and M. A. Mustafa.
Soil Sci. Vol 112, No 3, p 178-183. 1971. Illus.
Identifiers: *Infiltration rates, *Surface tension, Capillary action, Infiltration, Media, Soils.

Liquid surface tension and liquid-solid contact angle parameters were used to estimate relative initial rates of liquid entry into soil as a function of surface tension. The method can predict the surface tension at which infiltration rate will be maximized, and this value is very readily found for water-repellent soils. Expected relative rates were derived as a function of surface tension for 2 water-repellent and 2 wettable soils and were compared with actual infiltration and capillary rise data for the same media using both a series of aqueous ethanol and surfactant solutions. There was reasonable agreement between expected and actual rates of entry of ethanol solutions using both infiltration and capillary rise techniques. However, actual infiltration data with surfactant solutions and repellent soils did not give the expected result. The anomaly was attributed to the absorption of surfactant by the soil with a resultant increase in surface tension. This effect was not a major factor for the Pachappa sandy loam, which gave good agreement between expected and measured data. Surface tension-contact angle relationships are therefore useful in predicting relative initial rates of solution entry into soil provided interaction between soil and solution does not appreciably change the surface tension of the applied solution.--Copyright 1972, Biological Abstracts, Inc.
W72-13427

WATER REGIME OF MOUNTAIN CINNAMON CALCAREOUS SOILS UNDER FOREST AND STEPPE,
G. T. Turdyev.
Tr Nauchno-Issled Inst Pochvoved Tadzh SSR. Vol 13, No 1, p 195-201. 1969.
Identifiers: *Soil-water-plant relationships, *Soil moisture, Bluestem M, Calcareous soils, Forests, Grasslands, Hawthorn D, Licorice D, Moisture, Mountains, Precipitation, Soils, Walnut D, Willow D.

Studies were made of the water regime of cinnamon light-loamy soils under steppe (forbs with predominance of licorice and bluestem) and forest (willow, hawthorn, walnut) in the Tavil-Dara area (Tadzhik SSR). The loss of moisture from the 2-4 m layer was less under steppe than under forest. The soil under forest, received up to 669 mm of precipitation and lost the same amount, while that of steppe (40 m from the forest) received only 546 mm of precipitation but lost more. The differences between the soil moisture contents were the most pronounced in Sept.-Dec. The differences were insignificant in the 0-50 cm layer.--Copyright 1972, Biological Abstracts, Inc.
W72-13428

THE INFLUENCE OF SOIL TEMPERATURE ON THE CHEMICAL KINETICS OF FLOODED SOILS AND THE GROWTH OF RICE,
International Rice Research Inst., Los Banos, Laguna (Philippines).
D. Y. Cho, and F. N. Ponnamperuma.
Soil Sci. Vol 112, No 3, p 184-194. 1971. Illus.
Identifiers: *Crop production, Flood -water, Soil chemical properties, Flooding, Growth, Rice M, Soils, *Soil temperature.

The influence of 4 soil temperature regimes on the kinetics of Eh, pH, specific conductance, CO2, volatile organic acids, Fe++, Mn++, NH4+, NO3- and SO4-- in the solutions of 8 flooded soils planted to rice was studied in the greenhouse. The rates of chemical and electrochemical changes during the first 8 wk were: 38 to 20C > 30C > 20C > 15 to 31 to 18C. In all regimes, the concentrations of CO2, organic acids, Fe++ and Mn++ increased after flooding, reached peak values, and then declined. In the 38 to 20C and 30C regimes the peaks were early, short, and sharp, while in the 20C and 15 to 31 to 18C regimes they were late, high, and broad. Growth and yield of rice were in the order: 38 to 20C > 30C > 15 to 31 to 18C > 20C. Growth retardation at low temperature was more severe in the acid soils than in the neutral soils and was associated with high concentrations of CO2, volatile organic acids, and Fe++ in the soil solutions.--Copyright 1972, Biological Abstracts, Inc.
W72-13430

A NEW HYDROMETER,
California Univ., Davis.
For primary bibliographic entry see Field 07B.
W72-13432

INFLUENCE OF A SOIL MICROFLORAL CRUST ON SELECT PROPERTIES OF SOILS UNDER PINYON-JUNIPER IN SOUTHEASTERN UTAH,
Utah State Univ., Logan.
W. L. Loope, and G. F. Gifford.
Journal of Soil and Water Conservation, Vol 27, No 4, p 164-167, July-August 1972. 3 fig, 2 tab, 9 ref.

Descriptors: *Infiltration, *Sediment yield, *Lichens, *Soil chemical properties, *Land management, Land clearing, Soil conservation, Juniper trees, Erosion control, Soil erosion, Land reclamation, Brush control, Soil surfaces, Vegetation effects, *Utah.
Identifiers: *Lichen crusts.

Cryptogamic soil crusts on the Colorado Plateau were studied to determine their effect on infiltration rates, potential sediment production, permeability, and several chemical properties of the soil. Six different crust stages were identified. Undisturbed soil cores were used to determine intrinsic permeability under three treatments and disturbed soil samples were analyzed for pH, percent organic matter, soil texture, calcium plus magnesium content, and total conductivity. Cryptogamic crust had little effect on soil chemical properties. Analysis of undisturbed soil core data indicated that high cryptogamic cover tended to reduce intrinsic permeability, an effect that was reinforced when cores were irrigated. Sites with any degree of cryptogamic cover had significantly higher infiltration rates than chained areas (no lichen cover). Patterns of sediment production revealed a potential for increased sediment once the crust had been disturbed. (Knapp-USGS)
W72-13454

WATERSHED PHYSICS: SOIL VARIABILITY CRITERIA,
Agricultural Research Service, Beltsville, Md. Hydrograph Lab.
For primary bibliographic entry see Field 02A.
W72-13471

DYNAMICS OF ION TRANSPORT DURING MOISTURE FLOW FROM A DOUGLAS-FIR FOREST FLOOR,
Washington Univ., Seattle.
For primary bibliographic entry see Field 04A.
W72-13570

SALT DISPERSION COEFFICIENTS NEAR AN EVAPORATING SURFACE,
Colorado State Univ., Fort Collins. Dept. of Agronomy.
R. M. Todd, and W. D. Kemper.
Soil Science Society of America Proceedings, Vol 36, No 4, p 539-543, July-August 1972. 7 fig, 3 tab, 7 ref.

Descriptors: *Dispersion, *Evaporation, *Soil water movement, Ion transport, Diffusion, Mass transfer, Water chemistry, Convection, Salts, Diffusivity, Aqueous solutions.

A series of laboratory experiments was conducted to gain detailed information on water and salt movements near an evaporating surface. Columns instrumented with tensiometers and salinity sensors were used with coarse- and fine-textured soils. Water was supplied to a water table at the base of the columns and approximately steady state evaporation from the soil surface was established. Dispersion coefficients were calculated from salt gradients and evaporation rates in regions of the soil where suctions ranged from 0.1 to several bars. Dispersion increased solution flux and average solution velocity. Values obtained for dispersion coefficients corresponded closely with those obtained under more nearly saturated conditions at similar rates of solution flux. (Knapp-USGS)
W72-13577

SALT AND WATER MOVEMENT IN UNSATURATED FROZEN SOIL,
Agricultural Research Service, Kimberly, Idaho. Snake River Research Center.
J. W. Cary, and H. F. Mayland.
Soil Science Society of America Proceedings, Vol 36, No 4, p 549-555, July-August 1972. 6 fig, 1 tab, 16 ref.

Descriptors: *Diffusion, *Saline water, *Soil water movement, *Frost heaving, *Frozen soils, Leaching, Ion transport, Mass transfer, Ice, Frost, Freezing, Brines, Salinity, Unsaturated.
Identifiers: *Thermal diffusion, *Salt diffusion.

Salt and water movements were measured in unsaturated frozen soil columns incubated under a thermal gradient for 3, 6, or 9 weeks. Both water and salt moved from the warmer to cooler areas in the soil, creating a twofold concentration difference over a 24-cm distance. Movements of CaCl2, LiI, and K2SO4 were affected by cation exchange reactions and salt solubilities at high concentrations. Although mass flow of dissolved salts in a liquid film of water was the principal

transfer mechanism, both vapor and salt diffusion were sometimes significant. Thermal diffusion and salt sieving did not appear to be important. Because the vapor pressure of ice controls the water potential in frozen soil, the amount of unfrozen water and the matric suction could be calculated from a water release curve and from data of ice suspensions in salt solutions. Mass flow in the liquid phase is described by Darcy's law. Thus, salt flow as well as net water transfer can probably be predicted in unsaturated frozen soil using information available from unfrozen systems. (Knapp-USGS)
W72-13579

OBSERVED AND CALCULATED DISTRIBUTION OF LINDANE IN SOIL COLUMNS AS INFLUENCED BY WATER MOVEMENT,
California Univ., Riverside. Dept. of Soil Science.
For primary bibliographic entry see Field 05B.
W72-13580

INFLUENCE OF WATER AND TEMPERATURE ON ADSORPTION OF PARATHION BY SOILS,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel).
For primary bibliographic entry see Field 05B.
W72-13581

TRANSPORT NUMBERS AND MOBILITIES OF IONS IN BENTONITE MEMBRANES,
Negev Inst. for Arid Zone Research, Beersheva (Israel).
I. Shainberg, and W. D. Kemper.
Soil Science Society of America Proceedings, Vol 36, No 4, p 577-583, July-August 1972. 4 fig, 2 tab, 14 ref.

Descriptors: *Ion transport, *Osmosis, *Membrane processes, *Bentonite, *Adsorption, Soil water movement, Electrochemistry, Ion exchange, Aqueous solutions, Saline water systems.
Identifiers: *Wyoming Bentonite.

Na-clay was compacted by porous barriers between solutions of different concentrations. Conductance of the clay and electrical potentials across the clay were measured and used to calculate the transference numbers for the Na ion. The transference numbers calculated from conductivity studies were higher than those calculated from emf measurements. A qualitative explanation for the lower numbers estimated from potential measurement is proposed which involves osmotically induced convective movement. (Knapp-USGS)
W72-13582

HYDRAULIC CONDUCTIVITY EVALUATION OF THE SOIL PROFILE FROM SOIL WATER RETENTION RELATIONS,
Agricultural Research Service, Watkinsville, Ga. Soil and Water Conservation Research Div.
R. R. Bruce.
Soil Science Society of America Proceedings, Vol 36, No 4, p 555-561, July-August 1972. 10 fig, 3 tab, 14 ref.

Descriptors: *Hydraulic conductivity, *Soil water movement, *Unsaturated flow, *Moisture content, *Moisture tension, Particle size, Permeability, Percolation, Soil physics, Soil types, Retention.

The water content-suction relation applicable to field soil horizons that differ widely in texture was evaluated. Except for coarse-tectured, organic matter-deficient horizons, soil water retention of sieved samples is significantly modified and does not represent the natural soil volume. Water content-suction data from measurements on carefully procured core samples of each horizon of a Typic Hapludult adequately represent their water retention characteristics. Using appropriate water content-suction data, the hydraulic conductivity-water content relation calculated by published procedures was compared with hydraulic conductivity measured on similar samples by a transient outflow procedure. The calculated hydraulic conductivity-water content relations for coarse grained systems or systems having a relatively narrow range of pore size and well-defined bubbling pressure was sufficiently accurate for many purposes. However, to obtain a useful evaluation of the unsaturated hydraulic conductivity of fine-textured horizons with a very wide range of pore size and poorly defined bubbling pressure, the Marshall or Millington and Quirk methods had to be matched at a water content in the 0.1- to 0.3-bar range. Indiscriminate use of such methods of calculating hydraulic conductivity is inadvisable. (Knapp-USGS)
W72-13583

SOIL MORPHOLOGY AND WATER TABLE RELATIONS: I. ANNUAL WATER TABLE FLUCTUATIONS,
Oregon State Univ., Corvallis. Dept. of Soil Science.
L. Boersma, G. H. Simmons, and D. G. Watts.
Soil Science Society of America Proceedings, Vol 36, No 4, p 644-648, July-August 1972. 3 fig, 1 tab, 7 ref.

Descriptors: *Water table, *Water level fluctuations, *Mathematical models, *Water balance, *Soil properties, *Mathematical models, Soil types, Soil physics, Soil water movement, Drainage, Soil physical properties, *Oregon, Data collections.
Identifiers: *Willamette Valley (Oregon), *Water table model.

Water table positions were measured daily over a 2-year period at representative sites of five soil series comprising the Willamette association of nearly level soils with good to poor natural drainage. All soils had water tables present for some period during the winter. Perched water tables were present near the surface of the two most poorly drained series most of the winter. A mathematical model was developed for predicting water table positions on the basis of rainfall input and soil physical characteristics. The model was calibrated with measurements from the previous 29 years to reconstruct water table positions as they had occurred in the past. The computer procedure did not apply to the two poorly drained series because of the presence of an impermeable soil horizon near the surface. However, water table positions of these series were estimated satisfactorily by correlation with water table positions on the better-drained series. For a specific depth and month, the time the water table was above a given level increased as the natural drainage conditions became poorer. Thus, particular water table regimes are associated with drainage conditions of specific soil series. (Knapp-USGS)
W72-13584

SUBSTANCES CONTRIBUTING TO FIRE-INDUCED WATER REPELLENCY IN SOILS,
Northern Arizona Univ., Flagstaff. Dept. of Chemsitry.
S. M. Savage, J. Osborn, J. Letey, and C. Heaton.
Soil Science Society of America Proceedings, Vol 36, No 4, p 674-678, July-August 1972. 5 fig, 2 tab, 8 ref.

Descriptors: *Wettability, *Soil water movement, *Infiltration, *Burning, *Organic matter, Soil physical properties, Soil chemical properties, Forest fires, Gas chromatography.
Identifiers: *Water-repellent soils, *Soil hydrocarbons.

A soil susceptible to heat-induced water repellency was heated at several temperatures and oxygen concentrations. The materials emanating from the heated soil were captured and their mass determined. The greatest quantity of products was captured at temperatures above 300C. Increasing amounts of material were produced with increasing oxygen concentrations up to 20%. From 0.3% to 1.75% of the total soil was captured as products. Fractionation of these captured products by adsorption chromatography resulted in the isolation of several different components. Three of these components were capable of causing extreme water repellency in sand if the treated sand were heated. Some evidence suggested that the heating of these substances on the sand surfaces altered their structure. These three effective components represented from 25-50% of the total materials collected from the soil. Elemental and spectroscopic analyses of the effective components indicated them to be basically aliphatic hydrocarbons. The undecomposed and partially decomposed plant materials present in the soil were determined to be the primary source of the products coming from the heated soils. (Knapp-USGS)
W72-13585

SOIL MORPHOLOGY AND WATER TABLE RELATIONS: II. CORRELATION BETWEEN ANNUAL WATER TABLE FLUCTUATIONS AND PROFILE FEATURES,
Oregon State Univ., Corvallis. Dept. of Soil Science.
G. H. Simonson, and L. Boersma.
Soil Science Society of America Proceedings, Vol 36, No 4, p 649-653, July-August 1972. 4 fig, 4 tab, 8 ref.

Descriptors: *Water table, *Water level fluctuations, *Water balance, *Soil properties, Soil types, Soil physics, Soil water movement, Drainage, Soil physical properties, *Oregon, Data collections.
Identifiers: *Munsell value and chroma.

The frequency of occurrence of water tables at certain depths below the soil surface and the length of time water tables remained at or above these depths were calculated on the basis of rainfall records from a 29-year period. Results were correlated with soil morphological features. The average depth below the surface to the midpoint of the uppermost mottled horizon increased as the drainage condition of the series improved. At the depth of a given degree of mottling, the percentage of time a soil was submerged was essentially the same in a given month for all series. The size and abundance of iron and manganese concretions increased in a consistent manner in the sequence from well-drained to poorly-drained soils. The sequence of bleached A2 horizons over 'clay pan' horizons was specifically related to the perched water tables of the Dayton and Concord series. When color features were considered jointly, the morphological assessment of natural drainage class was found consistent with the water table regimes of the soils. (Knapp-USGS)
W72-13586

2H. Lakes

IRON AND MANGANESE PROFILES IN A COASTAL POND WITH AN ANOXIC ZONE,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 05A.
W72-13057

LAKE WATER QUALITY PREDICTIONS,
Ontario Water Resources Commission, Toronto.
For primary bibliographic entry see Field 05C.
W72-13060

ICE FORMED BEACH FEATURES FROM LAKE ST. JEAN, QUEBEC,
Centre de Recherche Forestiere des Laurentides, Quebec.
For primary bibliographic entry see Field 02C.
W72-13062

INVESTIGATION TECHNIQUES OF HYDROGEODYNAMIC PROCESSES IN THE LAKE BAYKAL AND ANGARA RIVER BASINS (GIDROGEODINAMICHESKIYE PROTSESSY V BASSEYNE BAYKALA I ANGARY I METODY IKH ISSLEDOVANIYA).

Izdatel'stvo 'Nauka', Moscow, V. I. Astrakhantsev, editor, 1971. 104 p.

Descriptors: *Hydrology, *Geology, *Engineering geology, *Lake basins, *River basins, Reservoirs, Reservoir construction, Reservoir operation, Shores, Waves (Water), Winds, Erosion, Mudflows, Geomorphology, Photogrammetry, Surveys, Investigations, Analytical techniques, Computers, Equations.
Identifiers: *USSR, *Siberia, Lake Baykal, Angara River, Sayan Mountains, Wind waves.

This collection contains 6 papers devoted to a study of hydrogeodynamic and hydrologic processes in the Lake Baykal and Angara River basins in southern Siberia and to development of a genetic classification of geologic and hydrophysical processes. Erosion, mudflow, channel, and shore phenomena are examined in the hydrogeodynamic category of geologic factors. Specific topics covered include: (1) construction and operation of reservoirs on the Angara River; (2) engineering-geologic conditions in the vicinity of the Ust'-Ilim reservoir; (3) mudflows in Eastern Sayan; (4) application of stereophotogrammetry to investigation of shore processes and wind waves on water bodies; (5) use of computers to calculate the wave-velocity field; and (6) investigation of the effects of wave runup on a shoreline. (Josefson-USGS)
W72-13069

TISSUE HEAT RESISTANCE OF PLANARIA AND ASELLUS OF LAKE OHRID IN YUGOSLAVIA,
Akademiya Nauk SSSR, Leningrad. Institut Tsitologii.
B. P. Ushakov, M. Milanovich, and S. Khadzhishche.
Dokl Akad Nauk SSSR Ser Biol. Vol 199, No 1, p 208-211. 1971. Illus.
Identifiers: Aquatic animals, *Asellus, *Heat resistance, *Lake Ohrid, *Planaria, Tissues, *Yugoslavia.

Lake Ohrid, like Lake Baikal, is one of the earth's few ancient lakes whose fauna is very rich with endemic species of animals. Experiments with Planaria and Asellus showed that the endemic species have a low tissue heat resistance, which is in accord with the relatively low temperature of their habitat. Differences in heat resistance of the tissue between endemic species and systematically close species of Planaria and Asellus inhabitating neighboring springs are insignificant.--Copyright 1972, Biological Abstracts, Inc.
W72-13105

DIATOMS OF THE AUVERNIER NEOLITHIC STATION (LAKE NEUCHATEL), (LES DIATOMEES DE LA STATION NEOLITHIQUE D' AUVERNIER (LAC DE NEUCHATEL)),
Neuchatel Univ. (Switzerland). Institut de Zoologie.
M. Wuthrich.
Schweizerische Zeitschrift fur Hydrologie, Vol 33, No 2, p 533-552, December 31, 1971. 8 fig, 14 ref.

Descriptors: *Diatoms, *Systematics, Chrysophyta, Sediments, Beds (Stratigraphic), Stratigraphy
Identifiers: *Lake Neuchatel, Amphora ovalis var pediculus, Hantzschia amphyoxis, Navicula scutelloides, Gyrosigma attenauatum, Cocconeis spp., Cyclotella comensis, Melosira italica, Stephanodiscus astrae var minutula, Cyclotella stelligera, Cyclotella stelligerioides, Fragilaria spp., Achnanthes spp., Cocconeis semiaperta, Mastogloia smithii var lacustris, Caloneis lepidula, Anomoeoneis exilis, Anomoeoneis styricca, *Navicula spp., Amphora veneta, Ostrupia zachariasi, Cymbella spp., Gomphonema spp.

Substrata samples were taken from a Neolithic station at Lake Neuchatel (Switzerland) and analyzed for the presence of diatoms. No specific excavation data accompanied the samples when sent for examination and identification. Only whole specimens are figured and some species were identified from small fragments. Some of the species found are being reported for the first time in Lake Neuchatel. (Holoman-Battelle)
W72-13143

LOCALIZATION OF FISH-LICE AND LEECHES IN CARPS DURING THE AUTUMN FISHING,
Vysoka Skola Veterinarni, Brno (Czechoslovakia).
K. Bazal, Z. Lucky, and V. Dyk.
Acta Vet. Vol 38, No 4, p 533-544. 1969.
Identifiers: *Fish parasites, Argulus foliaceus, Argulus japonicus, Autumn, *Carps, Czechoslovakia, Fin, Fish lice, Fishing, Infestation, Leeches, Localization, Piscicola geometra.

Two species of fish-lice (Argulus japonicus and A. foliaceus) and the fish leech (Piscicola geometra) were located on 300 leather and mirror carps from 3 ponds of the State Fishery in Pohorelice and on 350 common carps from 5 ponds of different production types (3 with market fish, 2 with stock fish) of the State Fishery in Benesov near Prague during the autumn of 1963. In ponds with weeds both species of lice were found, in pure cultures of stock fish only Argulus foliaceus localized on the caudal fin. 16.28% on the sides, 14.15% on the back and the least number was found on the anal fin (1.30%). Dyk's directive on the conclusive evidence of the caudal fin when detecting generative carps is supported. Of the total number of fish leeches that were isolated in the Pohorelice region, 32.71% were found on the head, 30.86% on the abdomen, 17.90% on the tail and caudal fin and no leeches were found on the pelvic fin. In the Benesov region most of the parasites were found on the abdomen (40.63%), 27.72% on the head, 10.60% on the tail and caudal fin and the least were found on the anal fin (0.90%). These results might lead to the conclusion that the predominant localization is different on common carps (Abdomen), but the influence of exterior factors such as the preparation of the ponds for fishing, its duration, the eutrophication, the economic condition, water sources, nitrogen balance during carp fishing, etc., cannot be underestimated, so the problem of the usual localization of leeches cannot yet be completely concluded.--Copyright 1972, Biological Abstracts, Inc.
W72-13155

COMPARISON OF RIDGE AND RUNNEL SYSTEMS IN TIDAL AND NON-TIDAL ENVIRONMENTS,
Western Michigan Univ., Kalamazoo. Dept. of Geology.
For primary bibliographic entry see Field 02J.
W72-13191

COASTAL PROCESSES AND NEARSHORE SAND BARS,
Western Michigan Univ., Kalamazoo. Dept. of Geology.
For primary bibliographic entry see Field 02J.
W72-13192

SURFACE SEDIMENTS IN LAKE TAHOE, CALIFORNIA-NEVADA,
California Univ., Davis. Inst. of Ecology; and California Univ., Davis. Dept. of Zoology.
For primary bibliographic entry see Field 02J
W72-13196

IMMEDIATE AND REMOTE DATA PROCESSING SYSTEM FOR LAKE CHAMPLAIN,
Vermont Univ., Burlington. Lake Champlain Studies Center.
For primary bibliographic entry see Field 07B.
W72-13262

GROWTH AND MINERAL ACCUMULATION OF SUBMERSED VASCULAR HYDROPHYTES IN PLEIOEUTROPHIC ENVIRONS,
Michigan State Univ., East Lansing. Inst. of Water Research.
For primary bibliographic entry see Field 05C.
W72-13294

A PREDICTIVE MODEL FOR THERMAL STRATIFICATION AND WATER QUALITY IN RESERVOIRS,
Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons' Lab. for Water Resources and Hydrodynamics.
For primary bibliographic entry see Field 05B.
W72-13309

CHANGES IN THE PHYTOPLANKTON OF THE DEVELOPING VOLTA LAKE,
Volta Lake Research Project, Akosombo (Ghana).
For primary bibliographic entry see Field 05C.
W72-13339

COMPARISON OF MERCURY LEVELS IN AN OLIGOTROPHIC AND A EUTROPHIC LAKE,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 05C.
W72-13340

HETEROTROPHIC MICROFLORA OF AMU DARYA RESERVOIRS AND ITS ROLE IN MINERALIZATION OF ORGANIC MATTER,
Akademiya Nauk Kazakhskoi SSR, Alma-Ata. Inst. of Microbiology and Virology.
For primary bibliographic entry see Field 05C.
W72-13341

TOTAL BACTERIAL NUMBER IN RYBINSK RESERVOIR,
Akademiya Nauk SSSR, Moscow. Institut Biologii Vnutrennykh Vod.
For primary bibliographic entry see Field 05A.
W72-13342

THE EFFECTS OF VARIATIONS IN OXYGEN TENSION ON CERTAIN ASPECTS OF RESPIRATORY METABOLISM IN PACIFASTACUS LENIUSCULUS (DANA) (CRUSTACEA:DECAPODA),
California Univ., Davis. Dept. of Zoology; and California Univ., Davis. Inst. of Ecology.
For primary bibliographic entry see Field 05C.
W72-13350

BENTHIC MACROINVERTEBRATES OF LAKE KOJIMA, WITH PARTICULAR REFERENCE TO POLLUTION EFFECTS OF INDUSTRIAL AND MUNICIPAL WASTES,
Ehime Univ., Matsuyama (Japan). Inst. of Biology.

For primary bibliographic entry see Field 05C.
W72-13366

THE IMPORTANCE OF AERIAL PHOTOGRAPHY IN ESTABLISHING MORPHOGENETIC CLASSES OF BOG AREAS AND SYSTEMS,
For primary bibliographic entry see Field 07B.
W72-13369

CORRELATION BETWEEN PRIMARY PRODUCTION, PLANKTON GROWTH AND LIGHT IN THE KUMMEROWER LAKE (MECKLENBURG),
Rostock Univ. (East Germany). Institut fuer Hygiene.
L. Kalbe, and H.-A. Schulze.
Z Gesamte Hyg Grenzgeb, Vol 17, No 9, p 658-664, 1971, Illus, Map.
Identifiers: *Limnology, Lakes, Abundance, Bream, Eels, Germany, Growth, *Kummerower lake, Light, Mecklenburg, Pikes, *Plankton, Primary productivity, Roach.

The plankton productivity of the lake was studied by the C14 method. The yearly average primary productivity of the lake amounts to 10,000 tons of photosynthetically bound C. The volume/O2 (V/O) quotient is 61%, indicating good trophic conditions. The lake water is a transparent yellow; at the short wave end of the visible spectrum there is a precipitous drop. The mean vertical light transmission coefficient is between 0.851 and 1.755; the photosynthetic compensation point is about 4.50 m. The abundance of fish such as roach, bream, eel, pike, etc., is listed for 1966-69.--Copyright 1972, Biological Abstracts, Inc.
W72-13401

THE VERTICAL DISTRIBUTION OF THIAMINE, BACTERIA AND PHYTOPLANKTON IN THREE LAKES IN EAST HOLSTEIN,
Muenster Univ. (West Germany). Botanisches Institut und Botanischer Garten.
For primary bibliographic entry see Field 05C.
W72-13402

THE GROWTH OF THE BREAM (ABRAMIS BRAMA (L.)) IN SELECTED LOCALITIES OF CENTRAL AND EASTERN EUROPE (PISCES, CYPRINIDAE),
Karlova Universita, Prague (Czechoslovakia). Inst. of Zoology.
J. Poupe.
Vestn Cesk Spol Zool, Vol 35, No 4, p 297-310, 1971, Illus.
Identifiers: Fish, *Abramis brama, *Bream, Cyprinidae, Czechoslovakia, *Fish growth, Localities, Pisces, USSR.

An evaluation is made on the growth of 1392 specimens of A. brama from 2 reservoirs situated in Czechoslovakia, one in the USSR and another from the Danube river. Good growth was observed of the fish coming from the Slapy reservoir, while less favorable growth was found in the Lipno reservoir. Likewise, growth was good in the Rybinsk basin and unfavorable in the Danube river.--Copyright 1972, Biological Abstracts, Inc.
W72-13404

THE GROWTH OF TENCH TINCA TINCA (L.), ROACH RUTILUS RUTILUS (L.) AND RUDD SCARDINIUS ERYTHRO-PHTHALMUS (L.) FROM THE LIBISZOWSKIE LAKES BEFORE SUPPLYING THE WATERS FROM THE WIEPRZ-KRZNA CANAL,
Wyzsza Szkola Rolnicza, Lublin (Poland).
R. Stronski.
Rocz Nauk Roln Ser H Rybactwo, Vol 93, No 2, p 67-85, 1971, Illus, Map, English summary.
Identifiers: *Fish populations, Growth, *Libiszowskie lakes, Poland, *Roach, *Rudd, Rutilus rutilus, Scardinius erythrophthalmus, Tench, Tinca tinca.

Age and growth of tench, roach and rudd from the Libiszowskie lakes are recorded under existing environmental conditions to provide data on the ecological effects of waters from the newly built Wieprz-Krzna canal which will be directed in the areas samples.--Copyright 1972, Biological Abstracts, Inc.
W72-13407

STRUCTURE OF THE PERCH POPULATIONS OF SOME PONDS IN FINLAND,
O. Sumari.
Ann Zool Fenn, Vol 8, No 3, p 406-421, 1971, Illus, Map.
Identifiers: Biomass, Burbot, *Finland, *Perches, Pikes, Ponds, *Fish populations, Roach.

The fish populations of 32 oligotrophic Finnish ponds, 0.6-64 ha in size and most of them without outlets, were poisoned by rotenone, and the numbers and biomasses of the fish species were calculated. Age determinations of perch, made chiefly by the scale method, proved difficult, but the mean lengths of 1-, 2-, and 3-summer-old perch were estimated as 5.6, 9.5, and 12.4 cm, respectively. In 1 pond all the perch were 6 yr old and of the same size. In others, the age groups were uniformly represented. During the first few summers the growth rate is the same as in larger waters, but later on it slows down and may nearly cease. The very different growth rates are probably correlated with the availability of food. Since the growth rate of older perch was high if young perch were available, it is concluded that the young form an important part of the food. The average biomass of perch in the ponds investigated was 11.9 (1.8-41.3) kg/ha. In ponds with a high number of 1-summer-old perch the biomass was smaller on the average than in ponds with few or no young. A new age group usually forms when there are few mature perch. The biomass of perch was significantly smaller in ponds with a reproducing roach population than in ponds without roach. The biomass of perch tends to decrease with increasing number of fish species. It is concluded that the size of each age group and the variation in the perch biomass mainly depend on the size and composition of the populations of perch and other fish. Although many mechanisms may be involved, the main factor affecting the perch populations in the ponds studied are biotic-predation upon perch young by perch, roach, pike and burbot, and the availability of suitable food.--Copyright 1972, Biological Abstracts, Inc.
W72-13417

SEASONAL FLUCTUATION OF PHYTOPLANKTON COMPOSITION, DIVERSITY, AND PRODUCTION IN A FRESHWATER LAKE,
North Carolina Univ., Chapel Hill. Dept. of Botany.
K. A. Meyer, and J. F. McCormick.
J Elisha Mitchell Sci Soc, Vol 87, No 3, p 127-138, 1971. Illus. Map.
Identifiers: Ankistrodesmus falcatus, Cyclotella stelligera, Dinobryon spp., Fragilaria, Lakes, *North Carolina, Nutrients, Oocystis lacustris, *Phytoplankton production, *Seasonal, Trachelomonas volvocina, Freshwater lakes.

A seasonal study of phytoplankton composition and production in a small freshwater lake in the Piedmont of North Carolina showed that the lake is oligotrophic, although average gross production was higher than that reported for other oligotrophic systems. Net production and phytoplankton abundance were maximal in the winter. Definite seasonal variations were noted in the phytoplankton populations. A base flora consisting of widely tolerant species (Oocystis lacustris, Trachelomonas volvocina, Ankistrodesmus falcatus) was dominant during most of the year. Ephemeral species including Dinobryon spp., Fragilaria sp., and Cyclotella stelligera exhibited brief dominance over the base flora when nutrient concentrations were lowest and light penetration relatively high. In particular, these factors most influenced the relative dominance of O. lacustris and Dinobryon bavaricum. Species diversity indicated the occurrence of a moderately complex system.--Copyright 1972, Biological Abstracts, Inc.
W72-13419

LAKE SUPERIOR--A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.

Available from NTIS, Springfield, Va 22151 as PB-211 666, Price $3.00 paper copy; $0.95 microfiche. Water Resources Scientific Information Center Report WRSIC 72-213, July 1972. 127 p.

Descriptors: *Bibliographies, *Abstracts, *Information retrieval, Hydrology, *Lake Superior, Data storage and retrieval, Documentation, Indexing, Publications, Hydrologic data, Reviews, *Great Lakes, *Eutrophication, Water quality, Water pollution, *Lake sediments, Michigan.

This is one in a series of bibliographies in water resources produced from the information base comprising only Selected Water Resources Abstracts (SWRA). At the time of search for this bibliography, the data base had 42,920 abstracts covering SWRA through June 15, 1972 (Volume 5, Number 12). A descriptor index is made up of a fraction of the total descriptors and identifiers by which each paper in this bibliography has been indexed. These descriptors represent weighted terms that best describe the information content and are indicated by asterisks. A comprehensive index represents all of the descriptors and identifiers by which each paper in this bibliography has been indexed. Through permutation, each word in a multiple-word descriptor or identifier is made to file in its normal alphabetic order, thus affording a multiple access to each abstract. Abstracts with full bibliographic details are listed in ascending accession number order. An author index is included. (Woodard-USGS)
W72-13480

LAKE MICHIGAN--A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.

Available from NTIS, Springfield, Va 22151 as PB-211 667, Price $3.00 paper copy; $0.95 microfiche. Water Resources Scientific Information Center Report WRSIC 72-211, August 1972. 264 p.

Descriptors: *Bibliographies, *Abstracts, Hydrology, *Lake Michigan, *Information retrieval, Publications, Data storage and retrieval, Documentation, Indexing, Reviews, Hydrologic data, *Eutrophication, Great Lakes, Illinois, Pollution abatement, Sewage effluent, Wisconsin, Lake sediments, Water pollution, Water quality.
Identifiers: *Chicago.

This is one in a series of planned bibliographies in water resources produced from the information base comprising only Selected Water Resources Abstracts (SWRA). At the time of search for this bibliography, the data base had 42,920 abstracts covering SWRA through June 15, 1972 (Volume 5, Number 12). Abstracts with full bibliographic details are listed in ascending accession number order. An author index is included. A descriptor index is made up of a fraction of the total descriptors and identifiers by which each paper in this bibliography has been indexed. These descriptors represent weighted terms that best describe the information content and are indicated by asterisks. (Woodard-USGS)
W72-13481

LAKE HURON--A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.

Available from NTIS, Springfield, Va 22151 as PB-211 668; Price $3.00 paper copy; $0.95 microfiche. Water Resources Scientific Information Center Report WRSIC 72-210, July 1972. 95 p.

Descriptors: *Information retrieval, Hydrology, *Lake Huron, *Abstracts, *Bibliographies, Data storage and retrieval, Hydrologic data, Publications, Documentation, Reviews, Indexing, Great Lakes, Michigan, *Eutrophication, Water pollution, Water quality.

This is one in a series of planned bibliographies in water resources produced from the information base comprising only Selected Water Resources Abstracts (SWRA). At the time of search for this bibliography, the data base had 42,920 abstracts covering SWRA through June 15, 1972 (Volume 5, Number 12). A descriptor index is made up of a fraction of the total descriptors and identifiers by which each paper in this bibliography has been indexed. These descriptors represent weighted terms that best describe the information content and are indicated by asterisks. A comprehensive index represents all the descriptors and identifiers by which each paper in this bibliography has been indexed. Through permutation, each work in a multiple-word descriptor or identifier is made to file in its normal alphabetic order, thus affording a multiple access to each abstract. Abstracts with full bibliographic details are listed in ascending accession number order. An author index is included. (Woodard-USGS)
W72-13482

STUDIES ON THE PLANTS OF THE GENESEE COUNTRY (WESTERN NEW YORK STATE): VI. THE AQUATIC FLORA OF CONESUS LAKE,
State Univ. Coll., Geneseo, N.Y.
For primary bibliographic entry see Field 05C.
W72-13487

STUDIES ON THE PLANTS OF THE GENESEE COUNTRY (WESTERN NEW YORK STATE): VIII. ALGAE OF CONESUS LAKE, LIVINGSTON COUNTY, NEW YORK: INITIAL REPORT,
State Univ. Coll., Geneseo, N.Y.
For primary bibliographic entry see Field 05C.
W72-13488

A STOCHASTIC APPROACH TO THE STUDY OF EVAPORATION FROM LAKE ONTARIO,
Cornell Univ., Ithaca, N.Y.
For primary bibliographic entry see Field 02D.
W72-13495

COMPARISONS OF TWO ANTARCTIC LAKES WITH DIFFERENT TROPHIC STATES,
Virginia Polytechnic Inst. and State Univ., Blacksburg.
For primary bibliographic entry see Field 05C.
W72-13511

INTERDISCIPLINARY INVESTIGATIONS OF THE CASPIAN SEA (KOMPLEKSNYYE ISSLEDOVANIYA KASPIYSKOGO MORYA).
Moscow State Univ. (USSR).

Izdatel'stvo Moskovskogo Universiteta, Moscow, Leont'yev, O. K., and Mayev, Ye. G., editors, 1971. 144 p.

Descriptors: *Limnology, *Lakes, *Lake morphology, *Lake shores, *Lake sediments, Geology, Geomorphology, Topography, Geophysics, Seismic studies, Mineralogy, Geochemistry, Diagenesis, Palynology, Biology, Shoreline cover, Vegetation, Organic matter, Water types, Salinity.
Identifiers: *USSR, *Caspian Sea, Mangyshlak Peninsula, Buzachi Peninsula, Paleogeography, Paleobotany.

This collection of 13 papers presents the results of investigations conducted in the region of the Caspian Sea in 1967-68 by the departments of geography, geology, and soil biology of Moscow State University. New information on the geology, paleogeography, and topography of areas bordering the Caspian Sea is based on analysis of geological, geomorphological, and paleobotanical data. The geomorphology of the Mangyshlak Peninsula and its shores is described in conjunction with the geochemistry, diagenesis, and engineering-geologic properties of Caspian Sea bottom sediments. Water types of the northern Caspian are analyzed together with the spatial distribution and temporal variability of sound intensity in sea water. The scope of investigations will make the book useful to those interested in the study of the Caspian Sea and in the utilization of its natural resources. (Josefson-USGS)
W72-13591

2I. Water in Plants

SOME STRUCTURAL FEATURES OF WATER IN PLANT TISSUES BASED ON INFRARED SPECTROSCOPY DATA,
Kazan State Univ. (USSR).
For primary bibliographic entry see Field 03F.
W72-13116

INDUCTION OF ROOT-PROMOTING SUBSTANCES IN EUONYMUS ALATUS 'COMPACTUS' BY INTERMITTENT MIST,
Cornell Univ., Ithaca, N.Y.
C. I. Lee, and H. B. Tukey, Jr.
J Am Soc Hort Sci. Vol 96, No 6, p 731-736. 1971. Illus.
Identifiers: *Root development, *Mist, Accumulation, Compactus, Cuttings, *Euonymus alatus D, Flavonoids, Induction, Leaves, Phenolic compounds, Root systems, Rutin, Senescence.

When the plants were grown under intermittent water mist during Sept., leaf senescence and onset of dormancy were delayed and natural root-inducing phenolic and flavonoid compounds accumulated in the leaf tissues. Consequently, stem cuttings taken from misted Euonymus rooted easily, whereas cuttings from non-misted plants rooted with greater difficulty. In addition, cuttings from misted stock plants rooted better in Oct. than did cuttings from non-misted plants in early summer. When rutin, a flavonol similar to those which accumulated in misted leaves, was supplied exogenously with IBA to stem cuttings taken from non-misted Euonymus, the cuttings rooted as well as cuttings from misted plants. Many substances in addition to auxins and rooting cofactors may play a significant role in root initiation.--Copyright 1972, Biological Abstracts, Inc.
W72-13125

WATER REQUIREMENTS OF THE CASSAVA PLANT (MANIHOT ESCULENTA),
Centro de Investigaciones Agronomicas, Maracay (Venezuela).
J. Garcia Benavides, and A. Montaldo.
Agron Trop (Maracay). Vol 21, No 1, p 25-31. 1971. Illus. English summary.
Identifiers: *Crop production, *Cassava D, Manihot esculenta D, Plants, *Water requirements.

The water requirements, as well as the intervarietal differences of M. esculenta, are presented. The water balance in the soil was analyzed.--Copyright 1972, Biological Abstracts, Inc.
W72-13136

THE EFFECT OF RAINFALL AND ALTITUDE ON THE YIELD OF PYRETHRINS FROM PYRETHRUM FLOWERS IN KENYA,
Pyrethrum Research Station, Molo (Kenya).
J. E. Parlevliet.
Pyrethrum Post. Vol 10, No 3, p 20-26. 1970. Illus.
Identifiers: *Altitude, Flowers, Kenya, *Pyrethrins, Pyrethrum D, *Rainfall.

Fresh pyrethrum flower yields in Kenya show a clear periodicity within the picking season. Three yield peaks are normally discerned, usually in June-July, Oct. and Jan.-Feb., respectively. Rainfall and temperature seem to govern these flower flushes. The pyrethrins per flower head, the pyrethrin content and the flower size increase and the dry matter content decreases with rainfall and higher altitude. Drought and lower altitudes have the reverse effect. Most clones vary in the same way, the interaction effect being very small compared to the total variation.--Copyright 1972, Biological Abstracts, Inc.
W72-13140

A STUDY OF SOME CHARACTERS OF METABOLISM OF SCOTCH PINE SEEDS DURING STORAGE IN SNOW,
V. I. Mosin.
Tr Inst Ekol Rast Zhivotn Ural Fil Akad Nauk SSSR. 62. p 185-189. 1968.
Identifiers: Accumulation, Carbohydrates, Catalase, Decomposition, Energy, Fats, Glucose, Metabolism, *Pine-G, Proteins, *Seeds, *Snow, Storage, Sugars.

Storage of seeds in snow intensifies the hydrolytic decomposition of fats and activates lipase. In germinating seeds, fats are reduced by 24%. The hydrolysis of fats is accompanied by an accumulation of carbohydrates. In germinating seeds stored in snow, invert sugar increases 80% and glucose increases more than 120%. Protein molecules are changed into smaller units, and into a more mobile state. Nonprotein N is increased by 23%. During the storage of seeds in snow the activity of enzymes increases. The catalase activity rises to 17.41, and the kinetic energy of the reaction is reduced to 8527 calories; the thermal coefficient drops to 1.65. The highest activity of metabolic processes occurs during the storage of germinating or soaked seeds in snow. The positive effect of storage in snow is minimal at the time of sowing, because the dried radicle breaks.--Copyright 1972, Biological Abstracts, Inc.
W72-13154

STUDIES ON THE REDUCTION OF THE TRANSPLANTING INJURY IN DECIDUOUS FRUIT TREES WITH SPECIAL REFERENCE TO THE JAPANESE PERSIMMON (III), (IN JAPANESE),
Ibaraki Univ., Mito (Japan). Faculty of Agriculture.
M. Izaki.
Sci Rep Fac Agr Ibaraki Univ. 17. p 85-105. 1969. Illus. English summary.
Identifiers: *Vegetation regrowth, *Deciduous trees, Fruit crops, Growth, Injury, Moisture, *Persimmon D, Pruning, Root systems, Soils, *Transplanting.

One of the main causes of transplanting injury in Japanese persimmon trees is root pruning accompanied by transplanting. The tree's fibrous roots are easily injured, and new root and shoot growth are markedly decreased under dry soil conditions. Selection or breeding of rootstocks should be performed to develop vigorous new roots among Japanese persimmon seedlings.--Copyright 1972, Biological Abstracts, Inc.
W72-13157

WATER BALANCE OF TISSUE SEGMENTS FROM LEAVES OF DIFFERENT INSERTION LEVELS,
Ceskoslovenska Akademie Ved, Prague. Ustav Experimentalni Botaniky.
J. Pospisilova.
Biol Plant (Praha). Vol 13, No 3, p 193-199. 1971. Illus.
Identifiers: *Plant tissues, *Water balance, Absorption, Brassica oleracea D, Climates, Deficit, Heterogeneity, Insertion, Leaves, Nicotiana tabacum D, Rates, Saturation, Segments, *Transpiration, Transport.

The heterogeneity of indicators of water balance was studied on tissue segments from leaves of Brassica oleracea L. var. acephala and Nicotiana tabacum L. under controlled conditions. Maximal values of transpiration rate, water absorption rate, water transport rate and low values of WSD (water saturation deficit) at the same time were observed at an initial WSD of 0% in segments from middle leaves and at an initial WSD of 20% mostly in segments from upper leaves. Although the properties of leaf tissue itself were probably the basic factors determining the actual heterogeneity of indicators of water balance, without connection with all other factors (e.g., various microclimates, supply of water) heterogeneity did not appear to a full degree.--Copyright 1972, Biological Abstracts, Inc.
W72-13236

WATER RETENTION PROPERTIES OF LEAVES,
Ministry of Works, Wellington (New Zealand).
G. J. Blake.
Hydrological Research Progress Report No 4, (1971), 11 p, 4 fig, 3 ref, append.

Descriptors: *Leaves, *Moisture content, *Retention, Investigations, Analytical techniques, Plant groupings, Wettability, Trees, Shrubs, Grasses, Measurements.
Identifiers: Leaf roughness, Angle measurements, Repellent surfaces.

Leaves of plants retain varying amounts of water, depending on their position relative to the horizontal and on their surface morphology. By measuring the contact angle of a water droplet of constant size, a wetting index was developed for different leaf surfaces. A profile projector was used to provide a silhouette of the leaf and droplet cross section on a screen. The angles between the droplet and the leaf surface were measured with a protractor and averaged. The 30 fresh samples included 20 tree and shrub species endemic to New Zealand, 8 exotic tree and shrub species, and 2 exotic grasses. The number of angle measurements for grasses was limited by the extremely water-repellent surfaces of some leaves (e.g. Anthoxanthum odoratum). While grasses (Lolium perenne and Dactylis glomerata) produce obtuse contact angles greater than 100 deg, 60% of the samples had acute angles between 50 deg and 70 deg, and no species had an angle less than 30 deg. All angles quoted are the arithmetic means of the respective samples. (Woodard-USGS)
W72-13261

MIGRATION RESPONSE OF JUVENILE CHINOOK SALMON TO SUBSTRATES AND TEMPERATURES,
Idaho Univ., Moscow. Water Resources Research Inst.
C. F. Morrill, and T. C. Bjornn.
Available from the National Technical Information Service as PB-211 608, $3.00 in paper copy, $0.95 in microfiche. Idaho Water Resources Research Institute, Moscow, Completion Report, June 1972. 27 p, 5 fig, 8 tab. OWRR A-038-IDA (1).

Descriptors: *Fish migration, *Chinook salmon, *Water temperature, Juvenile fish, Fish behavior.
Identifiers: *Substrates.

Downstream migration of age 0+ chinook salmon from stream channels with rock and rubble (good) or gravel or shale (poor) substrates and constant or declining water temperatures was assessed during the fall months of 1970 and 1971. As water temperatures declined, juvenile chinook left stream channels with gravel or shale substrates or moved into available hiding spaces in stream channels with °rock and rubble substrate. Fish initially emigrated as temperatures declined below 10C. The number of emigrants reflects the holding capacity of the substrate and the density of the fish population. The migration response varied with size and race of fish. Most of the response difference between races is attributed to differences in fish size. Juvenile spring chinook find rock and rubble substrate an important component of their winter habitat.
W72-13293

PHYSIOLOGICAL RESPONSES OF SORGHUM AND MAIZE LEAVES TO DROUGHT: IV. RESISTANCE OF LEAF TISSUES TO DEHYDRATION BY DETERMINING SUBLETHAL WATER DEFICIENCIES,
Consejo Superior de Investigaciones Cientificas, Madrid (Spain). Instituto de Edafologia y Biologia Vegetal.
For primary bibliographic entry see Field 03F.
W72-13380

THE DETERMINATION OF FLUORINE IN PLANTS WITH THE FLUORIDE ION SELECTIVE MEMBRANE ELECTRODE,
Ghent Rijksuniversiteit (Belgium). Dept. of Agricultural Science.
For primary bibliographic entry see Field 05A.
W72-13391

COLORIMETRIC DETERMINATION OF TOTAL PROTEIN AND NONPROTEIN NITROGEN IN PLANTS,
For primary bibliographic entry see Field 05A.
W72-13392

STIMULATION OF WITCHWEED GERMINATION BY RUN-OFF WATER AND PLANT TISSUES,
Agricultural Research Service, Stoneville, Miss. South Weed Science Lab.
J. E. Dale, and G. H. Egley.
Weed Sci. Vol 19, No 6, p 678-681. 1971.
Identifiers: *Germination, Runoff, Striga lutea D, Plant tissues, *Witchweed, *North Carolina.

Water from several bodies of surface water and sections from several plants were collected from eastern North Carolina, and bioassayed for stimulation of witchweed (Striga lutea Lour.) seed germination. Stimulatory activity was detected in water from 22 of 29 different ponds, streams, and lakes and in sections from 118 (57 families) of 163 plant species. Witchweed germination stimulants evidently occur widely in nature.--Copyright 1972, Biological Abstracts, Inc.
W72-13398

SOME ASPECTS OF THE LEAF TEMPERATURES OF SOME PLANTS OF THE XEROPHYTIC REGION OF SANTA MARTA (COLOMBIA),
Universidad Nacional de Columbia, Bogota. Dept. of Biology.
For primary bibliographic entry see Field 03B.
W72-13403

OXYGEN CONSUMPTION DURING THE EARLY STAGES IN SOME SELECTED BREEDS OF CARP IN COMPARISON WITH A LOCAL NONSELECTED BREED,
Alexandru Ion Cuza Univ., Iasi (Rumania).
P. Jitariu, M. Badilita, and E. Costea.
Stud Cercet Biol Ser Zool, Vol 23, No 3, p 213-217, 1971, Illus, English summary.
Identifiers: *Oxygen requirements, *Oxygenation, Breeds, *Carps, Fisheries.

A study was made on the intensity of O2 consumption of 3 races of carp, selected for pisciculture and compared to the local unselected race. The Yugoslavia race (third generation) had the highest O2 consumption equal to 569,305 mm3/g/hr, the improved race with scales had 467,090 mm3 O2/g/hr, the Ucraina race had 417,120 mm3 O2/g/hr, whereas the native race had a consumption of only 326,458 mm3 O2/g/hr. These differences indicate different resistance to conditions of water oxygenation.--Copyright 1972, Biological Abstracts, Inc.
W72-13405

MIGRATION OF SALMON SMOLT (SALMO SALAR L.) FROM THE DRAWA RIVER TO THE SEA,
Instytut Rybactwa Srodiadowego, Oliva (Poland).
R. Bartel.
Rocz Nauk Roln Ser H Rybactwo, Vol 93, No 2, p 7-11, 1971, Map, English summary.
Identifiers: *Fish migration, Poland, Drawa River (Poland), *Salmo salar, *Salmon, Smolt.

Results are given of observations made on the seaward movement of salmon smolts which were introduced in the Drawa River, Poland, during springtime.--Copyright 1972, Biological Abstracts, Inc.
W72-13406

RELATIVE HUMIDITY IN THE BREEDING SITES OF GLOSSINA MORSITANS WESTW. IN NORTHERN BOTSWANA,
Agricultural Research Station, Malkerns (Swaziland).
P. R. Atkinson.
Bull Entomol Res, Vol 61, No 2, p 241-246, 1971.
Identifiers: *Insects, Botswana, Breeding, *Glossina morsitans, *Humidity, Sites.

Humidity measurements in air spaces in the soil of G. morsitans breeding sites during the hot-dry season in northern Bostwana proved that ground holes were significantly more humid than tree holes, fallen logs or leaves. Site humidity decreased between Sept. and Oct. but did not differ significantly between riverine and mopane woodlands. Pupal mortality data demonstrated an apparent advantage in the dry season shift of breeding to holes. The evidence is only circumstantial that humidity is involved in site selection.--Copyright 1972, Biological Abstracts, Inc.
W72-13412

FECUNDITY OF THE YELLOW PERCH, PERCA FLAVESCENS MITCHILL, IN THE PATUXENT RIVER, MARYLAND,
Maryland Univ., Solomons. Natural Resources Inst.
C-F Tsai, and G. R. Gibson, Jr.
Chesapeake Sci, Vol 12, No 4, p 270-274, 1971, Illus.
Identifiers: *Fecundity, *Maryland, *Patuxent River, Perca flavescens, Perches, *Yellow perch.

The fecundity of 114 female yellow perch was studied during the 1969 spawning run (20 through 25 March) in the Patuxent River, Maryland. The fecundity was proportional to the total weight and gutted weight, respectively, as expressed by the regression equations $Y = 150.55730 X - 1424.0878$ ($r = 0.88$) for the former, and $Y = 217.65656 X - 2387.9915$ ($r = 0.87$) for the latter, (Y, fecundity; X, either total weight or gutted weight). It was nearly proportional to the quadruplicate of fork length as expressed by the regression equation, $\log Y = 3.7179 \log X - 1.50917$ ($r = 0.90$). This quadruplicate phenomenon was due in part to the

heavier proportionate increase in body weight and the visceral space available for egg development as the fish length increased.--Copyright 1972, Biological Abstracts, Inc.
W72-13413

AGE, GROWTH, YEAR CLASS STRENGTH AND SURVIVAL RATES OF THE WHITE PERCH MORONE AMERICANA (GMELIN) IN THE DELAWARE RIVER IN THE VICINITY OF ARTIFICIAL ISLAND,
Eastern Michigan Univ., Ypsilanti. Dept. of Biology.
D. C. Wallace.
Chesapeake Sci, Vol 12, No 4, p 205-218, 1971, Illus.
Identifiers: Age, Artificial Island, *Delaware River, Growth, *Morone americana, *Perches, Rates, Strength, Survival.

More than 1400 white perch were studied to determine growth, year class strength and survival rates in a section of the Delaware River. Except for young of the year, all specimens were collected with trawl and trap nets. There was no difference in size selection using these 2 methods. The annulus is a valid year mark. Most individuals had completed the annulus by mid-June. However, the period of annulus completion extended from at least the first wk in May to the end of July with older individuals completing the annulus later. In their first yr white perch attained approximately 40% of the length attained by the 8th yr. Young-of-the year continue growth through the month of Nov. while older fish grew little after Sept. Up to their 5th yr, females grew somewhat faster than males. Based on the 1960 through 1964 year classes males had higher survival rates than females. In general, growth rates were lower in this section of the river than was previously reported for the Patuxent or Delaware Rivers. For both sexes growth rates were greater in the east side of the river than in the west. This was not due to differences in mean temperatures. The 1964 and 1966 year classes were relatively strong compared with others. The relatively good growth in 1965 probably contributed to a higher number of recruit spawners in 1966. The number of fish older than age group III increased in July and Aug. collections and decreased progressively from Sept. through Nov. Very few fish older than age group VIII were captured.--Copyright 1972, Biological Abstracts, Inc.
W72-13415

MODELLING OF THE PRODUCTIVE PROCESS OF THE PLANT COVER,
A. Laisk, K. Moldau, T. Nil'Son, Y. Ross, and K. Tooming.
Bot Zh. Vol 56, No 6, p 761-776. 1971. Illus. English summary.
Identifiers: *Model studies, Photosynthesis, *Plant growth, Solar radiation, Respiration, Moisture stress, Adaptation.

Models of the radiation regime, productivity and growth, as well as those of the quantitative treatment of adaptation to radiation and to the water deficit of plants elaborated by the authors during the last few years are included. Fundamentals of the quantitative theory of productivity, solar radiation in plant stands, photosynthesis, respiration and its relationship with photosynthesis, growth, productivity, adaptation to radiation and adaptation to water deficit are discussed.--Copyright 1972, Biological Abstracts, Inc.
W72-13426

THE INDICATION OF THE SEEDS AND FRUITS OF COMMON SCOTTISH AQUATIC HERBS,
West of Scotland Agricultural Coll., Auchincruive (Scotland).
J. T. Swarbrick.
Bot Soc Edinburgh Trans. Vol 41, No 1, p 9-25. 1970.
Identifiers: *Aquatic plants, Fruits, *Herbs, Identification, Scotland, Seeds.

Keys, descriptions, and enlarged sketches are provided for seeds (or indehiscent fruits) of 46 species of common, widespread, and representative Scottish freshwater aquatic herbs.--Copyright 1972, Biological Abstracts, Inc.
W72-13438

PRELIMINARY DATA ON THE POPULATION OF THE ZONE OF PERMANENT CIRCULATION OF A KARSTIC MASSIF,
Centre National de la Recherche Scientifique, Moulis (France). Laboratoire Souterrain.
F. Lescher-Moutoue, and N. Gourbault.
C R Hebd Seances Acad Sci Ser D Sci Natur (Paris). Vol 271, No 16, p 1416-1419. 1970.
Identifiers: Circulation, Crustaceans, Gastropoda, *Karstic massif, Oligochaeta, Ostracoda, Plecoptera, Tricladida, *Aquatic life, *Hypogeous.

The Goueil di-Her grotto (Upper Garonne, France) was used for this study in which passages located in the permanent zone of water circulation in karsts are inhabited. Although subjected to violent floods, this cavity is populated by a rich association of aquatic species. The interstitial environment composed of the most stable biotope had the most abundant populations. The Goueil di-Her cave offers an example of passive transportation of certain species to the interior of karstic systems. A total of 28 spp., 14 of which were hypogeous were found. These included 10 spp. of Harpacticidae, 9 Cyclopidae, 2 Amphipoda, and 2 of Isopoda; 1 sp. of each of the following was also found: Tricladida, Oligochaeta, Gastropoda, Ostracoda, and Plecoptera.--Copyright 1972, Biological Abstracts, Inc.
W72-13448

INVESTIGATIONS OF SEAS BORDERING CENTRAL AMERICA (ISSLEDOVANIYA TSENTRAL'NO-AMERIKANSKIKH MOREY).
Institute of Biology of the Southern Seas, Sevastopol (USSR).
For primary bibliographic entry see Field 02L.
W72-13589

2J. Erosion and Sedimentation

MEASURED MOVEMENTS OF CLAY SLOPES IN THE OTTAWA AREA,
Queen's Univ., Kingston (Ontario). Dept. of Civil Engineering.
R. J. Mitchell, and W. J. Eden.
Canadian Journal of Earth Sciences, Vol 9, No 8, p 1001-1013, August 1972. 11 fig, 2 tab, 8 ref.

Descriptors: *Mass wasting, *Clays, *Landslides, *Canada, Mudflows, Erosion, Movement, Surveys, Data collections.
Identifiers: Ottawa (Ontario).

Natural degradation of slopes is normally considered to involve surficial displacements resulting mainly from frost action, erosion, and downhill creep. Measurements from inclinometer installations in a variety of slope profiles in the Ottawa area show that significant deep-seated movements may occur in these slopes. These movements are associated with seasonal peaks in groundwater pressures within the slope and may contribute to the long term degradation of the slope. While the factor of safety against catastrophic failure of a slope is of prime importance, the possible effects of deep-seated slope movements should not be disregarded when considering adjacent land use. (Knapp-USGS)
W72-13056

ORGANIC MATTER IN RED SEA SEDIMENTS,
Commonwealth Scientific and Industrial Research Organization, North Ryde (Australia). Div. of Mineralogy.
J. D. Saxby.
Chemical Geology, Vol 9, No 4, p 233-240, June 1972. 1 fig, 3 tab, 12 ref.

Descriptors: *Organic matter, *Bottom sediments, *Brines, *Water chemistry, Carbon radioisotopes, Carbon, Hydrogen, Nitrogen, Oxygen, Sulfur, Sampling, Sulfides, Pyrite, Sulfates, Sulfur bacteria.
Identifiers: *Red Sea.

Organic matter constitutes up to 1% of the sediments sampled in the hot-brine area of the Red Sea. A soluble fraction can be extracted from the salt-free sediment with benzene-methanol, and after chemical treatment with hydrochloric acid, hydrofluoric acid and lithium aluminum hydride, an insoluble organic sample is also obtained. An average composition of the latter is: C, 67%; H, 6%, N, 4%; O, 20%; S, 3%. Values obtained from the carbon isotope measurements are in the range expected for marine organic material. The amount and nature of the organic matter and its relation to sulfide minerals (mainly pyrite) indicate that: (1) Metal sulfide formation is principally a non-biological process in the Atlantis II Deep, whereas in other areas including the Discovery Deep, sulfate-reducing bacteria play a dominant role; (2) diagenesis of the organic material increases with depth in the core recovered from the Atlantis II Deep, suggesting sediment temperatures higher than in other parts of the hot brine area. (Knapp-USGS)
W72-13058

ICE FORMED BEACH FEATURES FROM LAKE ST. JEAN, QUEBEC,
Centre de Recherche Forestiere des Laurentides, Quebec.
For primary bibliographic entry see Field 02C.
W72-13062

A MICROSPLITTER FOR SUBSAMPLING SMALL PARTICULATE SAMPLES,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Soils.
R. Brewer, and K. J. Barrow.
Journal of Sedimentary Petrology, Vol 42, No 2, p 485-487, June 1972. 2 fig, 1 tab, 1 ref.

Descriptors: *Sampling, *Equipment, *Sedimentology, Particle size, Analytical techniques.
Identifiers: *Sample splitters.

A microsplitter was designed for subsampling small particulate samples. The splitting device rotates during operation. The present model can handle samples up to about 1.0 g in the size range 200 microns to 10 microns in a single operation. The principle could be used to construct a device to handle samples of any reasonable weight and grainsize. The microsplitter does not introduce a significant error in grain counts of mixtures of hornblende and quartz in the size range 20-50 microns. (Knapp-USGS)
W72-13183

A NEW FILTERING WATER BOTTLE,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
J. R. Schubel, E. W. Schiemer, T. W. Kana, and G. M. Schmidt.
Journal of Sedimentary Petrology, Vol 42, No 2, p 482-484, June 1972. 2 fig, 1 ref. NSF Grant GA-28276.

Descriptors: *Sampling, *Equipment, *Suspended load, Oceanography, Filtration, Water analysis.

A new filtering water bottle may be used for studies of suspended sediment. The bottle, made

from cast acrylic tubing, utilizes solid gum rubber balls as stoppers. After collection of a water sample one of the balls is removed, the bottle is fitted with a filter holder containing a pre-weighed filter, and connected to a vacuum system. No transfer of the water sample is required, thus decreasing the chances of ship-derived contamination. (Knapp-USGS)
W72-13184

A MULTIPLE GROUPING METHOD FOR THE CHOICE OF ISOPLETH VALUES OF MINERAL DISTRIBUTION MAPS,
LeNickel (Australia) Exploration Party Ltd., Perth.
S. B. Devine, P. E. Schilling, and R. E. Ferrell, Jr.
Journal of Sedimentary Petrology, Vol 42, No 2, p 476-481, June 1972. 5 fig, 1 tab, 5 ref. USGS Contract 14-08-001-10877.

Descriptors: *Sedimentology, *Statistical methods, *Mineralogy, *Mapping, Provenance, Variability, Contours, *Illite, *Gulf of Mexico.
Identifiers: *Isopleth values.

Grouping of means of mineral percentage determinations into subsets by Duncan's multiple range test may be used to obtain isopleth intervals for regional distribution maps. Isopleth values determined by this test have the advantage that a degree of confidence can be provided for defining significantly different areas. By comparison, arbitrarily chosen contour intervals may not define areas that are different. This is especially true when the data are imprecise. (Knapp-USGS)
W72-13185

A QUANTITATIVE X-RAY DIFFRACTION TECHNIQUE APPLIED TO FINE-GRAINED SEDIMENTS OF THE DEEP GULF OF MEXICO,
LeNickel (Australia) Exploration Party Ltd., Perth.
S. B. Devine, R. E. Ferrell, Jr., and G. K. Billings.
Journal of Sedimentary Petrology, Vol 42, No 2, p 468-475, June 1972. 3 fig, 3 tab, 16 ref. USGS Contract 14-08-001-10877.

Descriptors: *Mineralogy, *Sedimentology, *X-ray diffraction, Crystallography, Sediments, Analytical techniques, *Gulf of Mexico.

A quantitative X-ray diffraction technique enables the mineralogical analysis of fine-grained sediments with few errors due to sample preparation and conditions of analysis. Computation of linear interaction coefficients reduces the possibility that the change in the weight percent of one mineral will cause unreal variations in the abundance of others. The main advantage of the technique is that the use of peak intensity ratios modified by experimentally determined coefficients of interaction help eliminate differences between samples produced by the method of calculation. Comparison of the results of X-ray analyses of bulk sediments and size-fractionated ones from the surficial sediments of the deep Gulf of Mexico illustrate the technique. (Knapp-USGS)
W72-13186

SEDIMENTARY COMPONENTS OF NORTHWEST PACIFIC PELAGIC SEDIMENTS,
Oregon State Univ., Corvallis. Dept. of Oceanography.
R. K. Oser.
Journal of Sedimentary Petrology, Vol 42, No 2, p 461-467, June 1972. 4 fig, 1 tab, 26 ref. Project NR 083-102. ONR Contract N00014-67-A-0369-0007.

Descriptors: *Bottom sediments, *Particle size, *Statistics, *Pacific Ocean, *Provenance, *Clays, Clay minerals, Analytical techniques, Frequency analysis, Sampling.
Identifiers: *Pelagic sediments.

Many sediments, including the fine-grained pelagic deposits, possess polymodal grain size distributions. Resolution of individual modes shows them to be related either to compositional fractions or to depositional processes or both, and sometimes permits the tracing of dispersal patterns. The sedimentation balance provides a means of obtaining continuous cumulative size distribution curves of fine-grained sediments. The resultant cumulative curve is processed by computer to yield a size frequency curve which is often polymodal. This frequency curve is resolved into its individual components by analog computer. The method is discussed briefly and illustrated by a study of pelagic sediments from the Northwest Pacific. Samples collected nearest land have the most components and the best sorted components. Fifteen modes were decanted from five samples and X-rayed. Components from different samples were found to have similar compositions when plotted on a feldspar-kaolinite-mica ternary diagram. Based on like composition and nearly identical mean size values, it is possible to trace the sedimentary components from sample to sample. (Knapp-USGS)
W72-13187

INTRAGRANULAR GROWTH OF MARINE ARAGONITE AND MG-CALCITE: EVIDENCE OF PRECIPITATION FROM SUPERSATURATED SEAWATER,
Uppsala Univ. (Sweden). Dept. of Historical Geology and Paleontology.
For primary bibliographic entry see Field 02K.
W72-13188

ROUNDNESS-MINERALOGICAL RELATIONS OF SOME INTERTIDAL SANDS,
Illinois Univ., Urbana. Dept. of Geology.
For primary bibliographic entry see Field 02L.
W72-13189

MAP PATTERN RECONSTRUCTION FROM SAMPLE DATA: MISSISSIPPI DELTA REGION OF SOUTHEAST LOUISIANA,
Illinois Univ., Chicago. Dept. of Geological Sciences.
R. B. McCammon.
Journal of Sedimentary Petrology, Vol 42, No 2, p 422-424, June 1972. 2 fig, 1 tab, 4 ref.

Descriptors: *Mapping, *Sedimentology, *Louisiana, *Sampling, *Data collections, *On-site data collections, Deltas, Aerial photography, Surveys, Mississippi River, Statistics, Statistical methods, Sedimentation, Correlation analysis, Geomorphology, Sediments, Stratigraphy.

In many sedimentologic investigations, the primary aim in an area is to ascertain the underlying pattern of sedimentation and this includes usually the preparation of maps that depict the areal distribution of sediment types. Because sediments for the most part are covered by water and therefore not exposed to view, such maps are based on a limited number of samples collected at different geographic localities. The problem arises then as to how many samples should be taken in order to reconstruct the underlying pattern. A 10% random sample was found adequate to reconstruct the sedimentary environmental pattern of the Mississippi Delta region of southeast Louisiana. This result is based on visual interpretation of proximal maps and a statistic utilizing the Goodman-Kruskal measure of association for cross classification. (Knapp-USGS)
W72-13190

COMPARISON OF RIDGE AND RUNNEL SYSTEMS IN TIDAL AND NON-TIDAL ENVIRONMENTS,
Western Michigan Univ., Kalamazoo. Dept. of Geology.
R. A. Davis, Jr., W. T. Fox, M. O. Hayes, and J. C. Boothroyd.
Journal of Sedimentary Petrology, Vol 42, No 2, p 413-421, June 1972. 11 fig, 19 ref. USACE Contract DACW72-67-C--0004.

Descriptors: *Sand bars, *Beaches, *Sediment transport, *Geomorphology, *Surf, Winds, Waves (Water), Weather, Tides, Littoral drift, Ocean waves, Sand waves, Sands, Rip currents, Coasts, Currents (Water), *Lake Michigan.
Identifiers: Coastal geomorphology.

Beach and inner nearshore areas of Lake Michigan are basically the same as those of northern Massachusetts except for scale of the morphologic features and tidal range; in Lake Michigan spring tides reach 0.25 feet whereas in Massachusetts they reach 13 feet. Ridge and runnel topography is developed in the inner nearshore zone at both locations and is the result of storm activity. These ridges migrate shoreward during low energy conditions and eventually weld onto the beach. Overall morphology, surface features and internal structures are quite similar in both areas. The only appreciable differences between the two areas are the scale and rate of migration. Apparently tides have no appreciable affect on the sediment sequence that accumulates as ridges weld to the beach although tides are significant in determining the rate at which the shoreward migration of the ridges takes place. (Knapp-USGS)
W72-13191

COASTAL PROCESSES AND NEARSHORE SAND BARS,
Western Michigan Univ., Kalamazoo. Dept. of Geology.
R. A. Davis, Jr., and W. T. Fox.
Journal of Sedimentary Petrology, Vol 42, No 2, p 401-412, June 1972. 7 fig, 31 ref. ONR Contract 388-092.

Descriptors: *Sand bars, *Beaches, *Sediment transport, *Geomorphology, *Surf, Winds, Waves (Water), Weather, Tides, Littoral drift, Ocean waves, Sand waves, Sands, Rip currents, Coasts, Currents (Water), *Lake Michigan.
Identifiers: Coastal geomorphology.

In beaches and inner nearshore areas without tides, detailed daily topographic maps indicate a cyclic pattern in sedimentary processes. This pattern is the result of complex interaction between changes in shoreline configuration, discontinuous nearshore sand bars, and environmental variables such as barometric pressure, wind velocity, breaker height, and longshore currents. Of the 18 variables measured, barometric pressure provides the best index for changes in coastal processes. As a low pressure system approaches the coast there is an increase in wind velocity, breaker height, and longshore current velocity as barometric pressure drops. When the low pressure system passes, barometric pressure rises and there is reversal of wind direction with an accompanying reversal of longshore current direction. This cycle in conditions is accompanied by a pattern of responses in the position of morphology of the shoreline and sand bars. During low energy conditions shallow discontinuous sand bars have regularly spaced rip channels. Under high-energy conditions, rapid longshore currents are deflected by the sinuous shoreline, so that strong rip currents are formed. These rip currents pass over sand bar crests and excavate channels. At the same time new bars are forming as sediment accumulates in relatively quiet areas between rip channels. As a result there is apparent migration of the bar form. The return to low energy conditions yields a pattern much like that during the previous time of low energy. (Knapp-USGS)
W72-13192

PLEISTOCENE SEDIMENTOLOGY, CREDIT RIVER, SOUTHERN ONTARIO: A NEW COMPONENT OF THE BRAIDED RIVER MODEL,
McMaster Univ., Hamilton (Ontario). Dept. of Geology.

W. R. Costello, and R. G. Walker.
Journal of Sedimentary Petrology, Vol 42, No 2, p 389-400, June 1972. 9 fig, 2 tab.

Descriptors: *Sedimentary structures, *Pleistocene epoch, *Glacial drift, *Alluvial channels, *Braiding, Sediment load, Sediment transport, Deposition (Sediments), Sands, Gravels, Silts, Clays, Paleohydrology.
Identifiers: *Outwash channels, *Credit River (Canada).

Studies of modern and Pleistocene braided rivers complement each other. The advantage of modern studies is that flow parameters can be measured, and the advantage of Pleistocene studies in most North American areas is that exposure of flat-lying beds persists over a wider area, and that vertical sections can be studied unhampered by river stage and water table. Braided outwash streams deposited sands and gravels during the withdrawal of ice sheets from the Credit River Valley of Southern Ontario. The gravels are crossbedded on a scale of several feet, and fine upward into sandy cross-laminated and tabular cross-bedded facies. Within the sandy facies are several newly recognized coarsening-upward sequences. These begin with very fine clay, coarsening upward into faintly cross-laminated silts and ripple-drafted sands. Above the sands there is normally an erosive surface, then tabular cross-bedded coarse and pebbly sands. Above a second erosive surface lies large scale cross-bedded sandy gravels. The sequence is a channel fill. The clay represents overband flooding into an old disused channel within the braided system. As the flood stage rises, more and more suspended sediment is washed overbank, and flow within the channel gives rise to the cross-laminated silts and sands. The tabular cross-bedded coarse and pebbly sands indicate bed load material being washed into the new channel, and the uppermost erosion surface, followed by cross-bedded sandy gravels, suggests levee-breaching, and final incorporation of the old channel into the active part of the braided system. (Knapp-USGS)
W72-13193

PEBBLE ORIENTATION IN FLUVIAL SEDIMENTS,

Ottawa Univ. (Ontario). Dept. of Geology.
B. R. Rust.
Journal of Sedimentary Petrology, Vol 42, No 2, p 384-388, June 1972. 2 fig, 2 tab, 16 ref.

Descriptors: *Sedimentary structures, *Paleohydrology, *Alluvium, *Alluvial channels, *Gravels, Sedimentology, Channels, Deltas, Braiding, Sediment transport, Sedimentation, Bed load, Petrofabrics.
Identifiers: *Paleocurrent analysis, *Pebble orientation (Sedimentology).

Pebble orientation is an important paleocurrent indicator for those coarse fluvial gravels and conglomerates in which directional structures are rare, or confined to minor sand bodies. Field observations were made on the Donjek, a glacially-fed braided river in the Yukon, Canada. The highest degree of preferred orientation is obtained from populations of large pebbles isolated on sand beds. Smaller size or increased concentration of the pebbles reduces the degree of preferred orientation. With flat pebbles, a stronger upstream imbrication mode is developed when the pebbles are in contact. The method to be adopted for determining paleocurrents from gravel fabric should vary according to the nature of the gravel. The method of general applicability is based on the dip direction of the AB plane, which is especially useful when a high concentration of flat pebbles increases the degree of directional imbrication. However, when the pebbles are isolated on sand beds the paleocurrent can be more easily determined from the A axis orientations of elongate pebbles, using the imbrication of discs to distinguish upstream from downstream and longitudinal from transverse orientations. In this case, selection of larger pebbles will give a higher degree of preferred orientation, and a smaller sample may be measured without reducing the significance of the resulting paleocurrent vector. (Knapp-USGS)
W72-13194

FLUME EXPERIMENTS ON THE DURABILITY OF MUD CLASTS,

Illinois Univ., Chicago. Dept. of Geological Sciences.
N. D. Smith.
Journal of Sedimentary Petrology, Vol 42, No 2, p 378-383, June 1972. 6 fig, 12 ref.

Descriptors: *Erosion, *Mud, *Sedimentary structures, *Bottom sediments, Sedimentology, Sediment transport, Hydraulic models, Flumes, Clays.
Identifiers: *Mud clasts.

Erosion of cohesive mud is accomplished both by removal of individual mud grains and by plucking of larger aggregates which may then be transported as individual clasts. These aggregates occur in a wide range of shapes and sizes. Mud clasts may occur in any aqueous environment where velocities are sufficiently variable to deposit mud at one time and erode it later. A series of flume experiments was undertaken to investigate the origin and morphological development of mud aggregates. Mud clasts of three different sediment samples and varying water contents were eroded in a sand-bottomed flume at velocities of 25 cm/sec and 60 cm/sec. Clay-rich and initially plastic clasts resist erosion the best, but all clasts abrade and round quickly if velocities are high enough to transport them. This suggests that desiccation cracks are insignificant sources of natural mud clasts, and most mud intraclasts in sedimentary deposits probably underwent little transportation from their site of origin. (Knapp-USGS)
W72-13195

SURFACE SEDIMENTS IN LAKE TAHOE, CALIFORNIA-NEVADA,

California Univ., Davis. Inst. of Ecology; and California Univ., Davis. Dept. of Zoology.
J. E. Court, C. R. Goldman, and N. J. Hyne.
Journal of Sedimentary Petrology, Vol 42, No 2, p 359-377, June 1972. 7 fig, 3 tab, 30 ref. FWQA Contract 16010 DBU.

Descriptors: *Bottom sediments, *Lakes, *Nevada, *California, Provenance, Glacial drift, Diatoms, Mud, Sands, Sedimentation, Stratigraphy, Erosion, Organic matter, Sedimentology, Sediment transport.
Identifiers: *Lake Tahoe (Nev-Calif).

Samples from 40 sites in Lake Tahoe and from six major tributaries were analyzed for mineral and biogenic components and for texture. The areal distribution of volcanic constituents of sand and gravel fractions reflects volcanic sources in the north and northwest parts of the basin. Volcanic areas contribute montmorillonite to clay fractions whereas vermiculite and chloritic intergrades are characteristic weathering products of granitic sources. Two distinct types of sediment are present. Pollen-rich diatomaceous ooze (organic ooze) is characterized by: (a) abundant diatoms and pollen; (b) chloritic intergrades in the clay fraction; and (c) all from flat-lying, well stratified beds. The other sediment type (non-organic) is typified by: (a) diatoms and pollen rare or absent; (b) vermiculite/mica/montmorillonite clay fraction; (c) not present in flat-lying beds; and (d) texturally more varied than organic ooze. Non-organic samples represent still-exposed depositional products of the Tioga glaciation, reflecting relatively rapid erosion and slumping into deeper parts of the basin. The principal source of non-organic material was the west side where volcanic rocks constitute about half of the area. In contrast, organic ooze samples result from relatively passive post-glacial fluvial erosion. The relative abundance of biogenic components in organic ooze reflects low depositional rates and the clay fraction, rich in chloritic intergrades points to the dominance of granitic source rocks in the present basin-wide source. (Knapp-USGS)
W72-13196

SURFACE DIAGENESIS OF LIMESTONE,

Houston Univ., Tex. Dept. of Geology.
H. S. Chafetz.
Journal of Sedimentary Petrology, Vol 42, No 2, p 325-329, June 1972. 6 fig, 15 ref.

Descriptors: *Weathering, *Diagenesis, *Limestones, *Dolomite, Carbonate rocks, Sedimentary rocks, Stratigraphy, *Texas, Calcite, Magnesium carbonate, Calcium carbonate, Leaching.
Identifiers: *Morgan Creek (Tex).

Surface diagenesis caused by weathering of the Morgan Creek Limestone of central Texas resulted in dedolomitization, silicification, and aggradational recrystallization. Horizons displaying similar diagenetic properties in subsurface carbonate strata are indicative of superjacent unconformities. (Knapp-USGS)
W72-13197

RANDOM WALK MODEL FOR MOTION OF A SOLID PARTICLE IN TURBULENT OPEN--CHANNEL FLOW,

Technical Univ. of Istanbul (Turkey). Dept. of Hydraulic and Water Power.
M. Bayazit.
Journal of Hydraulic Research, Vol 10, No 1, p 1-14, 1972. 8 fig, 2 tab, 8 ref.

Descriptors: *Stochastic processes, *Simulation analysis, *Sedimentation, *Settling velocity, *Sedimentation rates, Particle size, Settling basins, Desilting, Probability, Statistical models, Model studies.
Identifiers: *Random walk models.

The settling of a solid particle in a turbulent flow can be treated as a stochastic process. A random walk model is especially suitable for this kind of analysis. Such a study was carried out for fully developed turbulent uniform open-channel flow at low Reynolds numbers and small depths. On a computer, the probability distribution of the settling length can be determined for various conditions. Results are useful in studying the settling phenomenon in models of settling basins. The macroscale turbulence was not taken into account, since a time interval is used that is related to the microscale eddies. Therefore, results are applicable only to the case of fine grains and relatively weak turbulence, which prevail in settling basins. A rough comparison with the distances at which the initial value of the concentration is reduced by half shows, however, that the stochastic method leads to significantly larger settling lengths than yielded by nonstochastic analyses. (Knapp-USGS)
W72-13201

A PRELIMINARY STUDY OF THE DISTRIBUTION AND MORPHOLOGY OF THE CAMINADA/MOREAU SAND RIDGES,

Aberdeen Univ. (Scotland).
W. Ritchie.
Southeastern Geology, Vol 14, No 2, p 113-125, June 1972. 7 fig, 12 ref.

Descriptors: *Deltas, *Beaches, *Mississippi River, *Provenance, Sedimentation, Erosion, Beach erosion, Deposition (Sediments), Sediment transport, Geomorphology, *Louisiana.
Identifiers: *Mississippi Delta, *Caminada/Moreau sand ridges.

The Caminada/Moreau sand ridges of south Louisiana are types of accretion ridges deposited near a

former outlet of the Mississippi River. The area of ridges, intervening swale lakes and marsh may be divided into four systems. The analysis of the form, orientation and sedimentary characteristics indicates a genetic difference between the oldest group of ridges and the remainder. The oldest ridges are distributary mouth accretion ridges; the younger are beach ridges. The field evidence suggests a relatively recent origin of the ridges. The relative positions of systems II, III and IV show a progressive shift eastward and suggest a littoral current coming from the northeast with a sediment source being located in the general vicinity of west Barataria Bay. Alternatively, the sediment source could have been highly localized near the present outlet of Bayou Lafourche and Bayou Moreau and brought to the coastline from the east as a result of a local cell-circulation such as exists at present near the Mermentau River. The present beach cuts the older ridge systems at an angle of approximately 30 deg and represents current processes and a recent history of subsidence and large scale coastline retreat in this area of south Louisiana. This coastal retreat is symptomatic of an insufficient input of beach materials to keep pace with deltaic plain subsidence. (Knapp-USGS)
W72-13203

EROSION OF SOME BULGARIAN SOILS BY IRRIGATION (IRRIGATSIONNAYA EROZIYA PRI SAMOTECHNOM OROSHENII NEKOTORYKH POCHV BOLGARII),
Institute of Water Engineering and Land Improvement, Sofia (Bulgaria).
V. S. Tatarova-Krysteva.
Pochvovedeniye, No 12, p 107-115, December 1971. 2 fig, 5 tab, 9 ref.

Descriptors: *Soil erosion, *Land management, *Irrigated land, *Irrigation water, *Irrigation, Furrow irrigation, Furrow drainage, Drainage water, Sediments, Sediment discharge, Organic matter, Humus, Nitrogen compounds, Phosphorus compounds, Nutrient removal, Soil properties, Soil aggregates, Soil groups, Soil types, Mineralogy.
Identifiers: *Bulgaria, *Smolnitzas, Microaggregates, Erosion hazard.

To study erosion of soils by irrigation water, investigations were carried out in 1965-1969 on Chernozems, Chernozem-Smolnitzas, and Gray and Cinnamon-Brown Forest soils in different administrative regions of Bulgaria. Chernozem-Smolnitzas in southwest Bulgaria and Chernozems in northern Bulgaria are less erodible than Cinnamon-Brown Forest soils in southern Bulgaria. Leached Chernozem-Smolnitzas are least erodible, while Chernozem-Smolnitzas transitional to Cinnamon-Brown Forest soils, and Calcareous and Typical Chernozems are most erodible. Depending on soil conditions and irrigation practices, the critical rate of flow of irrigation water varies widely, between 0.2 and 1.5 liter/sec. Soil erodibility can be reduced by increasing the length of furrows. An increase in furrow length from 20 m to 30 m reduces erosion by 71.8% and a 3- to 6-fold increase in furrow length to a maximum of 120 m reduces erosion by 42%. Particles 0.05-0.01 mm in diameter predominate in the sediment discharge, and the average organic-matter content in sediments is 0.47% higher than in the plowed layer. The amount of total nitrogen and readily-soluble P205 removed in surface drainage averages 0.5 mg/liter and 0.2 mg/liter, respectively. (Josefson-USGS)
W72-13283

ANALYSIS OF TOTAL WEIGHT OF HOLOCENE DEPOSITS IN THE SEA OF AZOV (ANALIZ ABSOLYUTNYKH MASS GOLOTSENOVYKH OTLOZHENIY AZOVSKOGO MORYA),
Akademiya Nauk SSSR, Moscow. Institut Geologii i Razrabotki Goryuchikh Iskopayemykh.
For primary bibliographic entry see Field 02L.
W72-13287

LATE QUATERNARY SEDIMENTATION IN THE ARGENTINE BASIN (OSOBENNOSTI POZDNECHETVERTICHNOGO OSADKOOBRAZOVANIYA V ARGENTINSKOY KOTLOVINE),
Akusticheskii Institut, Moscow (USSR).
I. I. Shurko.
Akademiya Nauk SSSR Doklady, Vol 198, No 3, p 696-698, 1971. 2 fig, 1 tab, 4 ref.

Descriptors: *Oceanography, *Atlantic Ocean, *Sedimentation, *Geologic time, Quaternary period, Recent epoch, Glaciation, Deposition (Sediments), Sedimentation rates, Sediment sorting, Particle size, Mineralogy, Aquatic life, Diatoms, Neritic, Littoral, Cores.
Identifiers: *USSR, *Argentine basin, *Oozes, Foraminifera, Terrigenous material, Concretions, Interglacial.

The Argentine basin is one of the largest but least studied deep-sea basins in the Atlantic Ocean. The sediment in mid-basin areas is a homogeneous, oily, greenish-gray ooze and differs from red clay in both color and composition. The principal sediment-source area in this part of the ocean is the coast of South America. The predominant heavy minerals are black ore minerals, hornblende, augite, and hypersthene. Of the 48 species of diatoms detected in the surface sediments, 10 are freshwater species, 6 are redeposited Tertiary species, and 16 are niritic sublittoral species. Analysis of a 260-cm long bottom core reveals that sedimentation conditions in the basin have changed repeatedly in the last 20 to 30 thousand years. In terms of grain size, the core can be divided into 4 units corresponding, on the Quaternary scale, to the Holocene epoch, the Wurm Glaciation, the Riss-Wurm Interglacial, and the Late Riss Glaciation. On the basis of this division, the rate of deposition of ooze in the basin in postglacial time can be estimated at 2 to 3.5 cm per 1,000 years. (Josefson-USGS)
W72-13288

SEDIMENT WATER INTERACTIONS IN SOME GEORGIA RIVERS AND ESTUARIES,
Georgia Inst. of Tech., Atlanta, Environmental Resources Center.
For primary bibliographic entry see Field 02K.
W72-13299

SEDIMENTATION AND CONTAMINANT CRITERIA FOR WATERSHED PLANNING AND MANAGEMENT,
Colorado State Univ., Fort Collins. Environmental Resources Center.
For primary bibliographic entry see Field 04C.
W72-13353

RESULTS OF SOIL EROSION STUDIES IN THE CHUVASH ASSR,
F. Y. Mikhailov, and S. V. Petrov.
Soobshch Chuv Zony Agrokhim Lab. 1. p 43-51. 1969.
Identifiers: *Soil erosion, *Soil investigations, Chuvash-ASSR, Erosion, Soils.

Identification and description of 7 soil erosion districts, with a schematic map are given.--Copyright 1972, Biological Abstracts, Inc.
W72-13370

SEDIMENT TRANSPORT AND ACCUMULATION IN A FJORD BASIN, GLACIER BAY, ALASKA,
Alaska Univ., College. Dept. of Geology; and Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 02L.
W72-13456

SOME PROPERTIES OF LINK MAGNITUDE FOR CHANNEL NETWORKS AND NETWORK PATTERNS,
Northwestern Univ., Evanston, Ill. Dept. of Geological Sciences.
For primary bibliographic entry see Field 02E.
W72-13458

EROSION OF SAND BEDS AROUND SPUR DIKES,
Ministry of Natural Resources, Sokoto (Nigeria).
M. A. Gill.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 98, No HY9, Paper 9198, p 1587-1602, September 1972. 7 fig, 3 tab, 17 ref, append.

Descriptors: *Erosion, *Scour, *Dikes, *River training, *Alluvial channels, Sands, Bottom sediments, Diversion structures, Turbulent flow, Sediment transport, Shear stress, Vortices, Eddies, Bed load, Channel erosion.
Identifiers: *Spur dikes.

The present status of research on erosion of sand beds around spur dikes is briefly reviewed. The experimental results of erosion of two different sizes of nearly uniform sand are presented. It is shown that a rather simple kinematic model for erosion of sand beds in a long contraction, first proposed by Straub, can be modified for application to erosion around spur dikes. The equilibrium depth of scour depends on the size of the sand and the flow depth upstream of the location of the spur dike. This is consistent with Laursen's observations around bridge piers. (Knapp-USGS)
W72-13572

CONTROL OF SEDIMENT IN CANALS.
For primary bibliographic entry see Field 04D.
W72-13576

INTERDISCIPLINARY INVESTIGATIONS OF THE CASPIAN SEA (KOMPLEKSNYYE ISSLEDOVANIYA KASPIYSKOGO MORYA).
Moscow State Univ. (USSR).
For primary bibliographic entry see Field 02H.
W72-13591

DISCOVERY OF MIOCENE MARINE SEDIMENTS ON THE CONTINENTAL SLOPE OF PETER THE GREAT BAY IN THE SEA OF JAPAN (OTKRYTIYE MORSKIKH MIOTSENOVYKH OTLOZHENIY NA KONTINENTAL'NOM SKLONE ZALIVA PETRA VELIKOGO (YAPONSKOYE MORE)),
Tikhookeanskii Nauchno-Issledovatelskii Institut Rybnogo Khozyaistva i Okeanografii, Vladivostok (USSR).
For primary bibliographic entry see Field 02L.
W72-13593

RELATION OF SUSPENDED ORGANIC MATTER, BOTTOM SEDIMENTS, AND BENTHOS TO BIOLOGICAL PRODUCTION (SVYAZ' ORGANICHESKOGO VESHCHESTVA VZVESI, DONNYKH OSADKOV I BENTOSA S BIOLOGICHESKOY PRODUKTIVNOST'YU),
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
Ye. A. Romankevich.
Akademiya Nauk SSSR Doklady, Vol 198, No 5, p 1199-1202, 1971. 2 fig, 1 tab, 11 ref.

Descriptors: *Oceanography, *Marine geology, *Bottom sediments, *Organic matter, *Benthos, Aquatic productivity, Aquatic microorganisms, Phytoplankton, Carbohydrates, Suspended load, Suspension, Pacific Ocean, Continental shelf, Continental slope, Correlation analysis.
Identifiers: *USSR, *Pelagic, *Terrigenous, Biogenous components, Photic zone, Euphotic zone.

Data on distribution of phytoplankton production, organic matter, and benthos were obtained in biologic, hydrochemical and lithologic studies in the southeastern Pacific. A linear correlation with a correlation coefficient of 0.9 exists between the concentration of suspended carbohydrates in the surface layer of bottom sediments and phytoplankton production. As depth increases, the concentration of suspended carbohydrates at most stations decreases. The pelagic distribution of organic matter is inherited from the distribution of organic matter in the photic region, particularly in the upper 200-m zone. The quantity of heterotrophic microorganisms is closely related to organic production and to concentration of suspended carbohydrates. Changes in total organic matter and carbohydrates in sediments are accompanied by a change in the abundance and biomass of the benthos. For the southeastern Pacific as a whole, the correlation coefficient of benthic biomass and organic-carbon content in sediments is +0.76; the correlation between benthic biomass and carbohydrates is +0.84. No correlation was found between ocean depth and the abundance and biomass of the benthos, the correlation coefficients being 0.02 and 0.08, respectively. (Josefson-USGS)
W72-13594

URANIUM IN OOZE SOLUTIONS OF THE SOUTHEASTERN ATLANTIC (URAN V ILOVYKH RASTVORAKH OSADKOV YUGO--VOSTOCHNOY ATLANTIKI),
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
G. N. Baturin.
Akademiya Nauk SSSR Doklady, Vol 198, No 5, p 1186-1188, 1971. 1 tab, 10 ref.

Descriptors: *Geochemistry, *Atlantic Ocean, *Sediments, *Uranium radioisotopes, Hydrogen ion concentration, Oxidation-reduction potential, Moisture content, Organic matter, Sea water, Continental margin, Diagenesis, Cores.
Identifiers: *USSR, *Ooze, *Pelagic, *Terrigenous.

Ooze solutions from sediment cores collected from the southeastern Atlantic in 1968 were investigated for uranium concentration, pH, Eh, and moisture content of sediments. The uranium concentrations is ooze solutions ranges from 1.3 to 650 micrograms/liter and in most samples is considerably higher than that in sea water. Uranium is uniformly distributed in waters of the southeastern Atlantic where its concentration is 3.2 micrograms/liter. Moisture content of the sediments ranges from 51% to 88% and does not affect the uranium content in ooze solutions. The Eh is highly variable and ranges from +500 mV in oxidized red clay to minus 200 mV in reduced sediments of the continental shelf and slope. The pH of sediments ranges from 7.10 to 8.06. Because of sharp differences in the lithologic composition of the sediments analyzed, there is generally no correlation between uranium content and pH or Eh. (Josefson-USGS)
W72-13596

HIGH MERCURY AND ANTIMONY CONCENTRATIONS IN CRETACEOUS AND PALEOGENE SEDIMENTS IN THE SOUTHERN KIRGIZ SSR (O POVYSHENNYKH SODERZHANIYAKH RTUTI I SUR'MY V MELOVYKH I PALEOGENOVYKH OTLOZHENIYAKH YUZHNOY KIRGIZII),
Akademiya Nauk Kirgizskoi SSR, Frunze. Institut Geologii.
Z. N. Polyarkova.
Akademiya Nauk SSSR Doklady, Vol 198, No 5, p 1189-1191, 1971. 4 tab, 3 ref.

Descriptors: *Geochemistry, *Sediments, *Metals, *Mercury, *Geologic time, Paleozoic era, Mesozoic era, Cenozoic era, Age, Rocks, Petrology, Stratigraphy, Chemical analysis.
Identifiers: *USSR, *Kirgiz SSR, *Antimony, *Cretaceous period, *Paleogene period, Paleogeography, Dispersion halos, Mineralization.

Cretaceous and Paleogene rock specimens collected from the Transalay and Alay Mountain ranges and Fergana in the Kirgiz SSR were investigated for mercury and antimony concentrations. The relatively high mercury and antimony concentrations are not associated with any specific genetic or lithologic rock type and are commensurate with the concentrations generally found in primary dispersion halos over these metal deposits. This supports earlier hypotheses regarding the possible occurrence of younger Mesozoic and Cenozoic mercury-antimony mineralization in the southern part of the Republic, in addition to the late Paleozoic mineralization already known. (Josefson-USGS)
W72-13597

2K. Chemical Processes

ORGANIC MATTER IN RED SEA SEDIMENTS,
Commonwealth Scientific and Industrial Research Organization, North Ryde (Australia). Div. of Mineralogy.
For primary bibliographic entry see Field 02J.
W72-13058

ROLE OF QUINONE GROUPS IN SOLUBILITY AND COMPLEXING OF METALS IN SEDIMENTS AND SOILS,
Bedford Inst., Dartmouth (Nova Scotia). Marine Geology Div.
For primary bibliographic entry see Field 05B.
W72-13059

INTRAGRANULAR GROWTH OF MARINE ARAGONITE AND MG-CALCITE: EVIDENCE OF PRECIPITATION FROM SUPERSATURATED SEAWATER,
Uppsala Univ. (Sweden). Dept. of Historical Geology and Paleontology.
T. Alexandersson.
Journal of Sedimentary Petrology, Vol 42, No 2, p 441-460, June 1972. 11 fig, 1 tab, 100 ref.

Descriptors: *Calcite, *Chemical precipitation, *Diagenesis, *Mineralogy, Magnesium carbonate, Calcium carbonate, Petrofabrics, Saturation, Sea water, Water chemistry, Sedimentology, Sedimentation, Crystal growth.
Identifiers: *Aragonite.

Nonskeletal aragonite and Mg-calcite is formed in the interior of hollow particles, such as shells, in West Indian and Mediterranean nearshore calcareous sediments. The calcite has 15 to 17 mole percent MgCo3 in solid solution. The intragranular fillings are best developed in sediments from turbulent environments; the carbonate is an addition to the particles, not reorganized initial grain substance. The growth processes represent slow precipitation under supersaturated conditions. The time needed for precipitation is estimated to be 100-1,000 years. Four kinds of fabric are found: ordered arrangement in monomineralic fringes of aragonite; random arrangement in Mg-calcite micrite, and in aragonite clusters. Changes in mineralogy during growth are from Mg-calcite to aragonite; changes in fabric are from ordered to random arrangement. Mineralogy and fabric vary on a microscopic scale, and the two polymorphs are evidently formed from natural seawater under the same general conditions. One important controlling factor is the growth substrate; biogenic aragonite induces nucleation and growth of aragonite, while biogenic calcite favors precipitation of Mg-calcite. The organic calcification matrices in the biogenic carbonates are probably active in the process. The intragranular precipitate is related in fabric and ultrastructure to various other shallow-marine carbonates, such as: beachrock cement; shallow submarine cement; and internal cement in reef-algal frameworks. Also the secondary carbonate in micrite envelopes appears to have the same properties. (Knapp-USGS)
W72-13188

SURFACE DIAGENESIS OF LIMESTONE,
Houston Univ., Tex. Dept. of Geology.
For primary bibliographic entry see Field 02J.
W72-13197

PERTURBATION ANALYSIS OF THE EQUATION FOR THE TRANSPORT OF DISSOLVED SOLIDS THROUGH POROUS MEDIA: II. BASIC NON-LINEAR PROBLEM,
Wisconsin Univ., Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 02F.
W72-13270

A REVIEW OF CARBON MONOXIDE SOURCES, SINKS, AND CONCENTRATIONS IN THE EARTH'S ATMOSPHERE,
General Electric Co., Philadelphia, Pa.
For primary bibliographic entry see Field 05B.
W72-13273

WATER PROPERTIES OF SOME SOILS IN THE TURKMEN SSR (O VODNYKH SVOYSTVAKH NEKOTORYKH POCHV I GRUNTOV TURKMENSKOY SSR),
Turkmenskii Gosudarstvennyi Pedagogicheskii Institut, Chardzhou (USSR).
For primary bibliographic entry see Field 02G.
W72-13281

DYNAMICS OF WATER-SOLUBLE SALTS UNDER ALFALFA IN A RICE CROP ROTATION (DINAMIKA VODNORASTVORIMYKH SOLEY POD LYUTSERNOY V RISOVOM SEVOOBOROTE),
For primary bibliographic entry see Field 03C.
W72-13284

CONTENT OF TOXIC SALTS IN WATER EXTRACTS AND SOIL SOLUTIONS OF GYPSUM--BEARING SOILS IN THE GOLODNAYA STEPPE (SODERZHANIYE TOKSICHNYKH SOLEY V VODNYKH VYTYAZHKAKH I V POCHVENNYKH RASTVORAKH GIPSONOSNYKH POCHV GOLODNOY STEPI),
Akademiya Nauk SSSR, Moscow. Pochvennyi Institut.
For primary bibliographic entry see Field 02G.
W72-13285

EFFECT OF FOREIGN COMPONENTS ON THE PRECIPITATION OF PHOSPHATE BY ALUMINUM,
Rutgers - The State Univ., New Brunswick, N.J.
For primary bibliographic entry see Field 05D.
W72-13290

DIFFUSIVITY OF BISULFIDE ION IN AQUEOUS SOLUTION,
Auburn Univ., Ala. Water Resources Research Inst.
For primary bibliographic entry see Field 01B.
W72-13292

SEDIMENT WATER INTERACTIONS IN SOME GEORGIA RIVERS AND ESTUARIES,
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.
K. C. Beck.
Available from the National Technical Information Service as PB-211 611, $3.00 in paper copy, $0.95 in microfiche. Georgia Environmental

Resources Center, Report ERC-0872, July 1972, 96 p., 8 fig, 10 tab, 75 ref. OWRR B-033-GA (2).

Descriptors: *Water chemistry, *Organic compounds, *Inorganic compounds, *Cation exchange, *Clay minerals, Chemical processes, Montmorillonite, Estuaries, Cation adsorption, Salinity, Georgia, Sediments, Southeast U.S.
Identifiers: Georgia Coastal plains - Satilla River, Ohoopee River, Canoochee River, Altamaha River, and Oconee Rivera, Southeastern U.S.

The objective was to determine how and to what extent the chemistry of fresh and saline waters is controlled by clay minerals and associate organic matter. Information is presented separately on Coastal Plain rivers and estuaries. Georgia Coastal Plain streams are characterized by low suspended load, low ionic strength, low pH, high PC02, dominance of Na-Cl over the more usual Ca-HC03-S04, relatively high proportions of Si02, Al, and Fe and high dissolved organic content. The streams chemistry is controlled by atmospheric input, weathering of the soils, and by organic compounds produced on decay of vegetation in swampy terrain. Hydrologic conditions control the relative importance of these factors. The lower Coastal Plain streams have an inorganic anion deficiency and charge balance is attained by organic anions. The streams chemistry departs markedly from that of the world average river. Estuaries of Coastal Plain streams normally exhibit simple river water-sea water mixing of major dissolved constituents. With the introduction of low pH, low Si02 waters by flushing of swamps during heavy rains, silicate minerals in the estuaries interact to modify water chemistry. Montmorillonite, with Mg (++) as the dominant exchange cation, appears to be involved, either absorbing H (+) and releasing Mg (++) and Si02 to form kaolinite or dissolving incongruently. Estuarine levels of Al and Fe appear to be controlled by pH-dependent precipitation reactions in addition to mixing. (Conway - Ga. Tech)
W72-13299

PLANT PHYSIOLOGY: ON THE DEUTERIUM CONTENT OF ORANGE JUICES,
Institut de Recherches Appliquees du Beissons, Montreuil (France).
J. Bricout, and L. Merlivat.
C R Hebd Seances Acad Sci Ser D Sci Nat (Paris), Vol 273, No 12, p 1021-1023, 1971.
Identifiers: *Plant physiology, Absorption, Deuterium, Juices, *Orange D.

The study of water formation in orange fruits by an analysis of its deuterium content was studied. The values of deuterium concentration in juice from oranges of different origins (Corsica, Morocco, Spain, Israel, Florida, and France) and the description of the technique of the analysis were given. The results indicated that the water of orange juice was richer in deuterium than the water absorbed by the orange-trees, a fact which involves a phenomenon of isotopic enrichment. Vacuum concentration of orange juice produces a further increase in its deuterium content. However, dilution of the concentrate by ordinary drinking water brings this level below the value obtained for the initial juice.--Copyright 1972, Biological Abstracts, Inc.
W72-13334

THE STRUCTURE AND SYNTHESIS OF A TETRAHYDRO-BETA-CARBOLINE ALKALOID FROM PHALARIS ARUNDINACEA: SOME NEW TETRAHYDRO-BETA-CARBOLINES,
University Coll. of South Wales and Monmouthshire, Cardiff. Dept. of Chemistry.
P. V. R. Shannon, and W. M. Leyshon.
J Chem Soc Sect C Org Chem. 16. p 2837-2839 1971.
Identifiers: Alkaloids, Carbolines, *Phalaris arundinacea M, Structure, Synthesis, *Tetrahydro-beta-carbolines.

The original structure of 2,9-dimethyl-6-methoxy-1,2,3,4-tetrahydro-beta-carboline for a new alkaloid from Phalaris arundinacea was shown to be incorrect by synthesis. 6-Methoxy-2-methyl-1,2,3,4-tetrahydro-beta-carboline was synthesized and is suggested as an alternative.--Copyright 1972, Biological Abstracts, Inc.
W72-13390

RADIOMETRIC DETERMINATION OF TRACE AMOUNTS OF ANIONIC SURFACTANTS IN GROUND WATER AND POTABLE WATER,
Liverpool Polytechnic (England). Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W72-13457

SOURCE AREAS AND CLIMATIC EFFECTS IN CARBONATE GROUNDWATERS DETERMINED BY SATURATION INDICES AND CARBON DIOXIDE PRESSURES,
Pennsylvania State Univ., University Park. Dept. of Geosciences.
For primary bibliographic entry see Field 02F.
W72-13465

DYNAMICS OF ION TRANSPORT DURING MOISTURE FLOW FROM A DOUGLAS-FIR FOREST FLOOR,
Washington Univ., Seattle
For primary bibliographic entry see Field 04A.
W72-13570

SALT DISPERSION COEFFICIENTS NEAR AN EVAPORATING SURFACE,
Colorado State Univ., Fort Collins. Dept. of Agronomy.
For primary bibliographic entry see Field 02G.
W72-13577

TRANSPORT NUMBERS AND MOBILITIES OF IONS IN BENTONITE MEMBRANES,
Negev Inst. for Arid Zone Research, Beersheva (Israel).
For primary bibliographic entry see Field 02G.
W72-13582

SUBSTANCES CONTRIBUTING TO FIRE-INDUCED WATER REPELLENCY IN SOILS,
Northern Arizona Univ., Flagstaff. Dept. of Chemsitry.
For primary bibliographic entry see Field 02G.
W72-13585

SALINE KARST (SOLYANOY KARST),
G. V. Korotkevich.
Izdatel'stvo 'Nedra', Leningrad, 1970. 256 p.

Descriptors: *Karst, *Karst hydrology, *Salts, *Geochemistry, Water chemistry, Topography, Geomorphology, Geology, Hydrodynamics, Hydrogeology, Groundwater, Brines, Limestones, Gypsum, Mineralogy, Saline lakes, Caves, Weathering, Solubility, Cycles.
Identifiers: *USSR, *Rock salt, *Karst topography, Karstic rocks, Karst lakes, Karst windows.

This monograph, which consists of 7 chapters, is devoted to investigation of saline karst and the hydrogeologic and hydrodynamic conditions essential to its development. The hydrogeology, evolution, and geologic role of saline karst are examined in connection with the geomorphic significance of weathering and solution and the concept of a distinct cycle of land-form evolution in rock-salt terrains. Existing and proposed methods are outlined for controlling saline karst in the exploitation of salt deposits. (Josefson-USGS)
W72-13590

URANIUM IN OOZE SOLUTIONS OF THE SOUTHEASTERN ATLANTIC (URAN V ILOVYKH RASTVORAKH OSADKOV YUGO--VOSTOCHNOY ATLANTIKI),
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
For primary bibliographic entry see Field 02J.
W72-13596

HIGH MERCURY AND ANTIMONY CONCENTRATIONS IN CRETACEOUS AND PALEOGENE SEDIMENTS IN THE SOUTHERN KIRGIZ SSR (O POVYSHENNYKH SODERZHANIYAKH RTUTI I SUR'MY V MELOVYKH I PALEOGENOVYKH OTLOZHENIYAKH YUZHNOY KIRGIZII),
Akademiya Nauk Kirgizskoi SSR, Frunze. Institut Geologii.
For primary bibliographic entry see Field 02J.
W72-13597

2L. Estuaries

EFFECTS OF TIDAL FLATS ON ESTUARINE WATER QUALITY,
Oregon State Univ., Corvallis.
For primary bibliographic entry see Field 05B.
W72-13063

POPULATION DYNAMICS AND LIFE HISTORY OF CREPIDULA CONVEXA SAY (GASTROPODA: PROSOBRANCHIA) IN DELAWARE BAY,
Connecticut Univ., Storrs.
G. Hendler, and D. R. Franz.
Biol Bull (Woods Hole). Vol 141, No 3, p 514-526. 1971.
Identifiers: *Crabs, *Crepidula convexa, *Delaware Bay, Development, Dispersal, Dynamics, Evolution, *Gastropods, Population, Prosobranchia, Sexuality, Life history studies.

The significance of protandric sexuality, direct development and phoretic dispersal for the population dynamics of C. convexa is described. An unusual egg mass structure is illustrated. When reproduction is maximal the population consists primarily of females which must be fertilized by a relatively smaller number of mobile males. The production of several broods of eggs result in an influx of juveniles. These develop shortly into males which transform to females by the following spring. C. convexa living on small hermit crabs rather than flat substrates form a dwarf population with a different morphology, mating behavior, breeding cycle and maturation rate. These differences are attributed to areal limitation of the substrate. Exchange of individuals between substrate subpopulations is facilitated by phoresis on hermit crabs. The high mobility of males, which makes phoresis possible, facilitates dispersal in the absence of planktonic larval stages and permits fertilization of a predominantly female population. It is suggested that, in C. convexa, a mating system involving motile males was preadaptive for the evolution of direct development.--Copyright 1972, Biological Abstracts, Inc.
W72-13127

ROUNDNESS-MINERALOGICAL RELATIONS OF SOME INTERTIDAL SANDS,
Illinois Univ., Urbana. Dept. of Geology.
R. J. Balazs, and G. DeVries Klein.
Journal of Sedimentary Petrology, Vol 42, No 2, p 425-433, June 1972. 11 fig, 6 tab, 34 ref. NSF Grant GA-21141.

Descriptors: *Particle shape, *Sands, *Intertidal areas, Beaches, Sediment transport, Tides, Tidal effects, Sedimentology, Sedimentation.
Identifiers: *Arkosic sands, *Bay of Fundy (Nova Scotia).

Medium to coarse-grained arkosic sands on an intertidal sand body in the Minas Basin, Bay of Fundy, Nova Scotia, show texturally supermature rounding. Average roundness is 0.49; 86 percent of all quartz grains are characterized by rounding in excess of 0.35. Quartz sand not only shows higher values of roundness (mean of 0.53) than associated orthoclase, plagioclase and recognizable rock fragments, but also shows a decrease in roundness with decreasing particle size. These intertidal sands are characterized also by higher values of roundness than their parent material (Triassic sandstone and basalt, and Pleistocene fluvioglacial drift). The higher degree of roundness of the intertidal sands is attributed to predicted high rates of grain collision known to occur during bedload transport by tidal currents. Intertidal sand bodies are characterized by equilibrium sand transport patterns through alternating flood-dominated and ebb-dominated portions of the sand body. As a consequence, a long distance of grain transport is predicted within a limited geographic area in response to such a transport mode. This limited geographic area may be located close to source terrains. High values of roundness therefore are a consequence of prolonged abrasion on such sand bodies. In comparison to known values of fluvial, beach, inland dune and coastal dune sands, intertidal sands are characterized by higher roundness values. High roundness values, associated with other sedimentary features, may indicate a similar transport history. (Knapp-USGS)
W72-13189

ANALYSIS OF TOTAL WEIGHT OF HOLOCENE DEPOSITS IN THE SEA OF AZOV (ANALIZ ABSOLYUTNYKH MASS GOLOTSENOVYKH OTLOZHENIY AZOVSKOGO MORYA),
Akademiya Nauk SSSR, Moscow. Institut Geologii i Razrabotki Goryuchikh Iskopayemykh.
I. A. Aleksina, and Z. P. Yedigaryan.
Akademiya Nauk SSSR Doklady, Vol 198, No 3, p 653-656, 1971. 1 fig, 2 tab, 14 ref.

Descriptors: *Sedimentation, *Deposition (Sediments), *Bottom sediments, *Weight, *Recent epoch, Geologic time, Sediment distribution, Sedimentation rates, Erosion, Carbonates, Benthos.
Identifiers: *USSR, *Sea of Azov, *Holocene sediments, *Deep-sea sediments, *Oozes, Terrigenous material, Biogenous material, Autochthonous, Allochthonous, Isobaths.

Holocene deposits in mid-sea areas of the Sea of Azov bounded by the 10-m isobath were investigated for total thickness of bottom sediments and their specific weights. Maximum weight of paleo-Azov deposits, composed of 27.5% carbonate shell material and 72.5% terrigenous and other components and confined to the southern part of the sea, is 1,627 g/sq cm. The oozes, represented primarily by clayey and silty-clayey varieties, constitute 40% of the total sediments and gravitate toward the southern and southwestern parts of the sea. Maximum weight of neo-Azov deposits, composed of 31.2% carbonate shell material and 68.8% terrigenous and other components and confined to the south-central part of the sea, is 1,190 g/sq cm. The oozes, amounting to 44.1% of the total weight, also occur in the southern and southwestern parts of the sea. The total annual amount of sedimentary material deposited in neo-Azov time over mid-sea areas (equal to 50% of the area of the sea) was 24.2 million metric tons. The sedimentation rate in mid-sea areas in neo-Azov time was 2.3 mm/yr and in paleo-Azov time, 1.4 mm/yr. (Josefson-USGS)
W72-13287

LATE QUATERNARY SEDIMENTATION IN THE ARGENTINE BASIN (OSOBENNOSTI POZDNECHETVERTICHNOGO OSADKOOBRAZOVANIYA V ARGENTINSKOY KOTLOVINE),
Akusticheskii Institut, Moscow (USSR).
For primary bibliographic entry see Field 02J.
W72-13288

SEDIMENT WATER INTERACTIONS IN SOME GEORGIA RIVERS AND ESTUARIES,
Georgia Inst. of Tech., Atlanta, Environmental Resources Center.
For primary bibliographic entry see Field 02K.
W72-13299

MERCURY IN SEDIMENTS FROM THREE VIRGINIA ESTUARIES,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 05B.
W72-13336

PHYTOPLANKTON PRODUCTION AND THE DISTRIBUTION OF NUTRIENTS IN A SHALLOW UNSTRATIFIED ESTUARINE SYSTEM NEAR BEAUFORT, N.C.,
National Marine Fisheries Service, Beaufort, N.C. Center for Estuarine and Menhaden Research.
For primary bibliographic entry see Field 05C.
W72-13337

COMPARISONS OF ENVIRONMENTAL ORDINATIONS WITH PRINCIPAL COMPONENT VEGETATIONAL ORDINATIONS FOR SETS OF DATA HAVING DIFFERENT DEGREES OF COMPLEXITY,
Great Lakes Forestry Research Center, Sault Sainte Marie (Ontario).
J. K. Jeglum, C. F. Wehrhahn, and J. M. A. Swan.
Can J For Res. Vol 1, No 2, p 99-112. 1971. Illus.
Identifiers: Environment, Fens, Marshes, Meadows, *Shrub types, *Vegetation, *Principal component analysis.

Data from a survey of lowland, mainly peatland, vegetation were subjected to environmental ordination based on measurements of water level and water conductivity, and to vegetational ordination derived from principal component analysis (PCA). Analyzed were the total set of the data (all types), half sets (nonwoody and woody types) and quarter sets (stands of marshes, meadows, shrub fens, and other woody types); the number of distinct physiognomic groups in a set of data, and presumably the amount of contained heterogeneity, decreased at each segmentation. The effectiveness of the ordination models was tested by correlating measured distances in 2-dimensional ordination models with 2W/ (A + B) indices of vegetational similarity for randomly selected pairs of types or stands. As the physiognomic complexity decreased, the effectiveness of the PCA vegetational ordination increased whereas that of the environmental ordination decreased. The environmental ordination seemed most appropriate to the date encompassing high complexity (total data set), while the PCA vegetational ordination seemed most appropriate to data with low complexity (quarter sets of the data).--Copyright 1972, Biological Abstracts, Inc.
W72-13421

FORECASTING THE EFFECTS OF POLLUTING DISCHARGES ON NATURAL WATERS - II, ESTUARIES AND COASTAL WATERS,
Water Pollution Research Lab., Stevenage (England).
For primary bibliographic entry see Field 05B.
W72-13437

THE ROLE PLAYED BY THE FISHERIES RESEARCH BOARD OF CANADA IN THE 'RED' HERRING PHOSPHORUS POLLUTION CRISIS IN PLACENTIA BAY, NEWFOUNDLAND,
Fisheries Research Board of Canada, Halifax (Nova Scotia).
For primary bibliographic entry see Field 05C.
W72-13439

STUDIES ON THE SHINER PERCH, CYMATOGASTER AGGREGATA GIBBONS, IN UPPER NEWPORT BAY, CALIFORNIA,
Long Island Univ., Southampton, N.Y. Southampton Coll.
G. Bane, and M. Robinson.
Wasmann J Biol. Vol 28, No 2, p 259-268. 1970. Illus. Map.
Identifiers: *Life history studies, Algae, Newport Bay, California, Crustaceans, Cymatogaster aggregata, Fish diets, *Perches, Fish reproduction, Fish behavior.

Life history studies were made on C. aggregata, a common bay fish in southern California. From specimens collected and analyzed over a 3 yr period in Newport Bay and closely adjoining areas, it was found that: C. aggregata is omnivorous, eating mostly small crustaceans and algae; the Newport Bay population is composed mostly of juvenile and 1-yr old adults; 2-year old fish emigrate to the ocean. Juvenile growth is rapid and adult size is reached within 1 yr when growth diminishes. Males are sexually mature at birth, and are distinguished from the females by dark breeding coloration and the presence of a copulatory structure on the anterior portion of the anal fin. Females are sexually responsive soon after birth and breeding occurs during the first summer. In 1 yr old adults, breeding occurs in the spring. Fetal development is in the oviduct and the young are nourished by the ovarian fluid. An average of 8 young are born in the spring. After mating, the adults leave Newport Bay and go into the ocean, returning to the shallow water the next spring to give birth.--Copyright 1972, Biological Abstracts, Inc.
W72-13453

SEDIMENT TRANSPORT AND ACCUMULATION IN A FJORD BASIN, GLACIER BAY, ALASKA,
Alaska Univ., College. Dept. of Geology; and Alaska Univ., College. Inst. of Marine Science.
C. M. Hoskin, and D. C. Burrell.
Journal of Geology, Vol 80, No 5, p 539-551, September 1972. 12 fig, 31 ref.

Descriptors: *Sediment transport, *Fjords, *Alaska, *Suspended load, Deposition (Sediments), Sedimentation, Stratified flow, Flocculation, Suspension, Mud, Density currents, Bed load, Deltas, Sedimentology.
Identifiers: *Glacier Bay (Alaska).

Sediment transport and accumulation were studied over several years to define the sedimentary environment in a fan-terminated, active valley glacier and adjacent fjord at Queen Inlet, Glacier Bay National Monument, Alaska. Recently exposed ice-contact sediment at the glacier snout is entrained during summer and early fall by meltwater streams crossing a subaerial-intertidal outwash fan. Suspended sediment in the meltwater (sediment loads exceed 1 g/liter at the inlet head) subsequently yields a cold, surface sediment plume overlying warmer saline water in the fjord basin. Mixing of these layers produces flocculation and settling occurs in discrete layers; each layer represents one tidal cycle. No gravel is present in fjord floor sediment, although both colluvium and outwash fan sediments contain gravel. This gravel distribution eliminates sliding, slumping of the outwash fan, and ice rafting as major contributors to fjord basin sediment in Queen Inlet. Piston cores of muddy fjord basin sediment show annual, cyclical, thin, black horizons. Spacing of these marker

horizons indicates that sediment accumulation may exceed 1 m/year at the inlet head. The fjord floor is cut by sinuous valleys with natural levees, terraces, and sandy silt axial sediment. These valleys are the result of sediment-transporting bottom currents. (Knapp-USGS)
W72-13456

ON AN AERIAL MEASUREMENT OF RADIATIVE TEMPERATURE PATTERNS OVER THE THERMAL POLLUTED WATER (IN JAPANESE),
Toba Merchant Marine Coll. (Japan).
For primary bibliographic entry see Field 05B.
W72-13483

HELE-SHAW MODEL OF LONG ISLAND AQUIFER SYSTEM,
Southern Methodist Univ., Dallas, Tex. Inst. of Tech.
For primary bibliographic entry see Field 02F.
W72-13578

INVESTIGATIONS OF SEAS BORDERING CENTRAL AMERICA (ISSLEDOVANIYA TSENTRAL'NO-AMERIKANSKIKH MOREY).
Institute of Biology of the Southern Seas, Sevastopol (USSR).

Izdatel'stvo 'Naukova Dumka', Kolesnikov, A. N., editor, 1971. 140 p.

Descriptors: *Data collections, *Investigations, *Hydrobiology, *Aquatic life, Aquatic animals, Aquatic plants, Aquatic algae, Aquatic microorganisms, Aquatic bacteria, Benthos, Plankton, Plankton nets, Aquatic productivity, Biomass, Organic matter, Organic compounds, Inorganic compounds, Paints, Bathymetry, Maps.
Identifiers: *USSR, *Central America, *Cuba, *Caribbean Sea, *Gulf of Mexico, Biocenoses, Bathometers.

This book, containing 10 papers, is the third and last in the series of publications devoted to the results of biological investigations conducted by the Soviet-Cuban Marine Expedition in 1964-65. Attention is focused on the planktonic and benthic animal and plant life of the Caribbean Sea and Gulf of Mexico. Growth of heterotrophic bacteria on the surface of Soviet and Cuban antifouling paints submerged to a depth of 1 m in the Gulf of Mexico is compared with the development of bacteria colonies on the surface of Soviet paints submerged in the vicinity of Sevastopol Bay in the Black Sea. (Josefson-USGS)
W72-13589

DISCOVERY OF MIOCENE MARINE SEDIMENTS ON THE CONTINENTAL SLOPE OF PETER THE GREAT BAY IN THE SEA OF JAPAN (OTKRYTIYE MORSKIKH MIOTSENOVYKH OTLOZHENIY NA KONTINENTAL'NOM SKLONE ZALIVA PETRA VELIKOGO (YAPONSKOYE MORE)),
Tikhookeanskii Nauchno-Issledovatelskii Institut Rybnogo Khozyaistva i Okeanografii, Vladivostok (USSR).
B. I. Vasil'yev, and N. P. Vasil'kovskiy.
Akademiya Nauk SSSR Doklady, Vol 198, No 5, p 1195-1198, 1971. 1 fig, 4 ref.

Descriptors: *Oceanography, *Marine geology, *Continental slope, *Sediments, *Tertiary period, Quaternary period, Age, Mud, Rocks, Mineralogy, Protozoa, Diatoms, Geological surveys, Palynology.
Identifiers: *USSR, *Soviet Far East, *Sea of Japan, *Miocene epoch, Pliocene epoch, Tuffite, Radiolaria, Foraminifera.

Miocene sediments in Peter the Great Bay and adjoining areas of the Sea of Japan were discovered during marine geological surveys conducted in 1969 by the Pacific Division of the P. P. Shirshov Institute of Oceanography. Between the Tyumen'-Ula Estuary and Point Gamov, the Continental slope lies at depths of 130 to 3,000 m and is 10- to 12-km wide. The slope in this area is dissected by submarine canyons. A 10- to 30-cm thick layer of greenish-gray silty mud is found at a depth of 130 m as well as along the canyon sides and on the continental slope. At depths of 130 to 150 m, this mud is underlain by boulder and pebble beds, which most likely correlate with the widespread Suyfun suite of Pliocene age in the basin of the Suyfun River flowing into the Amur Bay. Below the boulder-pebble horizon, the continental slope consists of Miocene silty tuffite, covered by a 30-cm thick layer of Quaternary silty mud with pebbles and grit. Tuffite and tuffaceous limestone are considered to be the bedrock in this part of the slope and abound in radiolaria, foraminifera, and diatoms. The most representative diatoms consist of typically marine Miocene species and of examples of Pliocene flora. The diatom species identified correlate with the assemblage of diatoms in Mayamrafskaya and diatom suites of Sakhalin and in Miocene sediments of other regions of the Far East. (Josefson-USGS)
W72-13593

03. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

INVESTIGATION OF METALLIDE COATINGS FOR SEAWATER PUMP COMPONENTS,
Little (Arthur D), Inc., Cambridge, Mass.
For primary bibliographic entry see Field 08G.
W72-13141

DESALTING,
National Water Commission, Arlington, Va. Engineering and Environmental Div.
V. A. Koelzer.
Available from the National Technical Information Service as PB-209 942, $5.45 in paper copy, $0.95 in microfiche. National Water Commission Report NWC-EES 72-045, May 1972, 134 p.

Descriptors: *Desalination, *Desalination processes, *Cost analysis, *Water costs, *Water supply, *Water purification, Economic feasibility, Environmental effects, Economies of scale, Maintenance costs, Technical feasibility, Brine disposal, Distillation, Crystallization, Membrane processes, Geothermal studies, Energy, Osmosis, Forecasting.
Identifiers: *Energy costs, *Water markets.

Based on a comprehensive review of desalting literature and interviews with experts in the field, the state of the art of desalting technology is evaluated. Progress on desalting technology is summarized, and applicability of distillation, crystallization, membrane and chemical processes is described. In an attempt to evaluate the markets for desalted water, water costs, economies of scale and other marketing factors are considered. Applications of desalting technology are considered for incremental supply, to improve quality of supply, for intermittent operations, in dual-purpose plants, to renovate water for reuse, and for agriculture. The report concludes that desalting is presently a technically feasible source of new water for situations of specialized need, and makes research recommendations. (NWC)
W72-13354

REVERSE OSMOSIS SEPARATIONS USING A TREATED POLYAMIDE MEMBRANE,
Du Pont de Nemours (E. I.) and Co., Wilmington, Del.
L. A. Cescon, and H. H. Hoehn.
U. S. Patent No. 3,551,331, 17 p, 16 fig, 11 tab, 6 ref; Official Gazette of the United States Patent Office, Vol 881, No 5, p 2027, December 29, 1970.

Descriptors: *Patents, *Membranes, *Desalination, Salt water, Brackish water, *Reverse osmosis, Water quality, Potable water, Resins, Thin films, Permeability, Separation techniques, Treatment.

A process is disclosed for the separation of a liquid mixture containing at least about 25% by weight water. Emphasis is on the linear aliphatic polyamide resin membrane. The membrane is about 2-75 microns thick and when dry has a wide angle X-ray diffraction pattern indicating a high degree of crystallinity. The small angle X-ray diffraction pattern has an extrapolated intercept scattering intensity at zero scattering angle of about 50-220. The water permeability of the membrane is 50-50,000. Effective treating agents include protonic acids, specified Lewis acids and selected lyotropic salts. The membrane may be a flat film or hollow fiber. (Sinha-OEIS)
W72-13527

APPARATUS FOR COMBINING VAPORS,
Saline Water Conversion Corp., Oradell, N.J. (assignee).
J. Lichtenstein.
U. S. Patent No. 3,551,298, 5 p, 3 fig, 1 tab, 17 ref; Official Gazette of the United States Patent Office, Vol 881, No 5, p 2020, December 29, 1970.

Descriptors: *Patents, *Desalination, Sea water, *Evaporation, *Condensation, Vaporization, *Flash distillation, Equipment, Separation techniques.

A flash type evaporation process approaches an ideal reversible process. The energy contained within the flash is preserved with a high degree of efficiency. Vapor streams of each step are combined in a remote nozzle system which utilizes the respective pressure differentials between the respective steps to bring all the vapor streams to a common flow velocity in a common stream. The kinetic energy is recompressed in a diffusor into corresponding pressure for condensation. (Sinha-OEIS)
W72-13528

PERMEABLE MEMBRANE AND METHOD OF MAKING AND USING THE SAME,
Amicon Corp., Cambridge, Mass. (assignee).
For primary bibliographic entry see Field 05D.
W72-13535

TREATMENT OF WATER,
For primary bibliographic entry see Field 05F.
W72-13539

MULTISTAGE DISTILLATION FOR DESALINIZING SALINE WATER,
J. P. Hingst, and G. D. Heidelbaugh.
U. S. Patent No. 3,527,676, 3 p, 1 fig, 7 ref; Official Gazette of the United States Patent Office, Vol. 878, No. 2, p 425, September 8, 1970.

Descriptors: *Patents, *Desalination, Sea water, Potable water, *Distillation, Vaporization, *Heat transfer, Separation techniques, Equipment, *Condensation.

The saline water is preheated by passing it through the condensate coil in the plant's final stage. The preheated saline water is passed into the first stage and then successive stages. Each stage is of lower pressure than the preceding stage. In stage one the saline water is heated further and vaporized at a temperature below the rapid scaling temperature. The vapor is condensed on the exterior of a unique heat transfer percolation coil and the condensate is

collected as potable water. Similar condensation occurs at several stages and finally all condensates are combined. (Sinha-OEIS)
W72-13547

3B. Water Yield Improvement

EVALUATION OF POTENTIAL BENEFITS OF WEATHER MODIFICATION ON AGRICULTURE,
Illinois State Water Survey, Urbana.
S. A. Changnon, Jr., and F. A. Huff.
Available from NTIS, Springfield, Va 22151 as PB-206 250, Price: $3.00 paper copy; $0.95 microfiche. Final Contract Report, Part II, Appendix, October 31, 1971. 59 p, 73 tab. USBR Contract 14-06-D/-6843.

Descriptors: *Agroclimatology, *Weather modification, *Cloud seeding, *Crop response, *Illinois, Corn (Field), Soybeans, Model studies, Regression analysis, Rainfall, Summer, Hydrologic data, Soil properties, Crop production, Agriculture, Agronomy, Costs, Economics.
Identifiers: Crop yield increases.

An investigation was made on the potential effects of modifying growing-season rainfall on the yields and economic benefits of the two major Illinois crops, corn and soybeans. Crop yield and weather data for the 38-yr period, 1931-1968, were used to develop multiple regression equations relating crop yield to technology trends and various temperature and precipitation parameters. This was done for each of 13 regions with similar yield characteristics. Hypothetical seeding models were then used with the appropriate regional equation to evaluate the effects of seeding-induced changes in July-August rainfall on crop yield. Frequency distributions were developed to define expected gains or losses from seeding under assumed seeding operations lasting 1, 2, 3, and 5 yrs. In most of the regions, corn and soybean crops would be benefited in the growing seasons through a cloud seeding program. Reaction to the potential seeding varied substantially between regions with the same seeding model because of differences in soil properties and climatic variations. Furthermore seeding effectiveness may vary considerably from year to year with the same model in the same region due to the temporal variability in daily rainfall distribution characteristics. (Woodard-USGS)
W72-13053

HYGROSCOPIC SEEDING IN OKLAHOMA: VOLUMES I AND II,
Flight Test Research, Inc., Long Beach, Calif.
P. B. MacCready, Jr.
Available from NTIS, Springfield, Va 22151 - Vol 1, PB-205 361; Vol 2, PB-205 362. Price $3.00 each, paper copy; 95 cents microfiche. Final Contract Report to U S Bureau of Reclamation, 2 Vol, October 31, 1971. Vol I - 40 p, 10 fig, 1 tab, 9 ref; Vol 2 - 30 p, 1 fig, 1 tab. USBR Contract 14-06-D-7190.

Descriptors: *Cloud seeding, *Artificial precipitation, *Oklahoma, Droughts, Aircraft, Clouds, Nitrogen compounds, Rainfall intensity, Rain gages, Data collections, Precipitation (Atmospheric).
Identifiers: Hygroscopic materials.

In July 1971, because of apparent drought in southwest Oklahoma, a rainfall augmentation program was organized under the direction of the Division of Atmospheric Water Resources Management of the Bureau of Reclamation with funding provided by the Federal Office of Emergency Preparedness. Seeding flights were accomplished on 10 days during the period from mid-August to early October, with a record wet September for Oklahoma. The program is described and many of the concepts and factors behind hygroscopic seeding are examined. Field notes and daily plots of flights made during the rainfall augmentation program are included. (Woodard-USGS)
W72-13065

SOME ASPECTS OF THE LEAF TEMPERATURES OF SOME PLANTS OF THE XEROPHYTIC REGION OF SANTA MARTA (COLOMBIA),
Universidad Nacional de Columbia, Bogota. Dept. of Biology.
R. Schnetter.
Mitt Inst Colombo-Aleman Invest Cien Punta De Betin. 5. p 31-36, 1971, Illus, English summary.
Identifiers: *Plant physiology, Leaves, Boerhavia erecta D, Calotropis procera, Climate, Colombia, Heliotropium angiospermum-D, Ipomoea, Carnea D, Pereskia colombiana D, Plants, Prosopis juliflora D, Santa Marta (Colombia), *Temperature, Tribulus cistoides.

Leaf temperatures of several plant species (Boerhavia erecta, Heliotropium angiospermum, Tribulus cistoides, Calotropis procera, Ipomoea carnea, Pereskia colombiana and Prosopis juliflora) of the xerophytic vegetation near Santa Marta (Colombia) were studied during the dry and the wet season. The leaves of species growing in a cactus thorn scrub reached very high temperatures, especially in the dry season, while leaf temperatures of plants in the area of a semi-deciduous seasonal forest were lower because of more favorable conditions of water supply and microclimate.--Copyright 1972, Biological Abstracts, Inc.
W72-13403

3C. Use of Water of Impaired Quality

DETERMINATION OF CHANGES IN SOIL BULK DENSITY IN A RICE FIELD FOR ESTIMATION OF THE DESALINATION EFFECTS OF FLOODING (UCHET IZMENENIY OB'YEMNOGO VESA POCHVY RISOVOGO POLYA DLYA OTSENKI RASSOLYAYUSHCHEGO DEYSTVIYA ZATOPLENIYA),
Dagestanskii Nauchno-Issledovatelskii Institut Selskogo Khozyaistva, Makhachkala (USSR).
For primary bibliographic entry see Field 02G.
W72-13280

DYNAMICS OF WATER-SOLUBLE SALTS UNDER ALFALFA IN A RICE CROP ROTATION (DINAMIKA VODNORASTVORIMYKH SOLEY POD LYUTSERNOY V RISOVOM SEVOOBOROTE),
N. F. Reshetnyak.
Pochvovedeniye, No 12, p 100-106, December 1971. 3 tab, 5 ref.

Descriptors: *Water chemistry, *Salinity, *Salts, *Alfalfa, *Land management, Rotations, Agronomic crops, Rice, Plant growth, Root systems, Soil profiles, Soil types, Chestnut soils, Groundwater, Water table, Excess water (Soils), Sulfates, Chlorides, Bicarbonates, Mapping.
Identifiers: *USSR, *Ukraine, *Solonetzes, *Meadow soils, Soil samples, Magnesium sulfate, Mineralization.

The relation of groundwater depth to salt content of residually solonetzic Meadow-Chestnut medium loam soils on rice fields in the southern Ukraine is examined. Very rapid secondary salinization of the plowed horizon under alfalfa occurs when mineralized groundwater rises substantially above the critical level. The maximum amount of water-soluble salts is found in the lower part of the soils' illuvial horizon and directly below. Sodium, magnesium, and calcium sulfates and bicarbonates predominate, while the content of chlorides is insignificant. In the nature and extent of its root system, alfalfa is unable to prevent salinization under high water-table conditions. Excess wetting and salt accumulation in the plowed horizon impair alfalfa growth, reducing its potentialities by 20%-25%. (Josefson-USGS)
W72-13284

CONTENT OF TOXIC SALTS IN WATER EXTRACTS AND SOIL SOLUTIONS OF GYPSUM--BEARING SOILS IN THE GOLODNAYA STEPPE (SODERZHANIYE TOKSICHNYKH SOLEY V VODNYKH VYTYAZHKAKH I V POCHVENNYKH RASTVORAKH GIPSONOSNYKH POCHV GOLODNOY STEPI),
Akademiya Nauk SSSR, Moscow. Pochvennyi Institut.
For primary bibliographic entry see Field 02G.
W72-13285

AMELIORATION OF SALINE SOILS IN THE FLOODPLAIN AND DELTA OF THE VOLGA RIVER,
A. V. Berdnikova.
Uch Zap Astrakh Gos Pedagog Inst. 16: p 83-102. 1969.
Identifiers: *Saline soils, *Soil treatment, Amelioration, Drainage, Flooding, Paddy M, Volga River, Soils, Trigonella D, USSR.

Successful development of soils in the Volga delta for paddy fields can only be achieved by desalination and drainage. Good tillage practices and the sowing of Trigonella are also recommended.--Copyright 1972, Biological Abstracts, Inc.
W72-13374

CHANGES IN INTRARUMINAL FUNCTION OF SHEEP WHEN DRINKING SALINE WATER,
Commonwealth Scientific and Industrial Research Organization, Adelaide (Australia). Div. of Nutritional Biochemistry.
B. J. Potter, D. J. Walker, and W. W. Forrest.
Br J Nutr. Vol 27, No 1, p 75-83. 1972.
Identifiers: *Animal physiology, Flora, Rumen, *Saline water, *Sheep.

A study was made of the changes in electrolyte concentrations and ruminal function which resulted from the provision of 1.3% sodium chloride (NaCl) solutions instead of freshwater to sheep consuming roughage rations in chaffed and in ground pelleted forms. Significantly higher osmotic pressures were observed in the rumen fluid of the sheep drinking saline water, the change being especially marked when the ration was ground and pelleted. Of the individual electrolytes measured, Cl showed a larger rise in concentration than did Na plus K and it appeared that the Na and Cl ions in the ingested saline water were differentially removed from the rumen. Provision of 1.3% NaCl solution in place of freshwater resulted in greater voluntary intakes of fluid and consequently in greater flows of fluid through the rumen. Based upon measurements of DNA and polysaccharide, there appeared to be a tendency for the total microbial populations in the rumens of sheep drinking 1.3% NaCl solution to be smaller than for the sheep drinking freshwater. The total metabolic activity of the rumen flora, measured calorimetrically, was not appreciably changed when saline water was drunk and the chaffed ration eaten, but was significantly reduced when the ration was ground and pelleted. Adaptation of the rumen microflora to high concentrations of NaCl was demonstrated in animals accustomed to drinking 1.3% NaCl solution.--Copyright 1972, Biological Abstracts, Inc.
W72-13429

3D. Conservation in Domestic and Municipal Use

AN ALGORITHM FOR OBTAINING OPTIMAL LOOPED PIPE DISTRIBUTION NETWORKS,
Parsons, Brinckerhoff, Quade and Douglas, New York. Water Resources Systems Group.
For primary bibliographic entry see Field 08A.
W72-13042

WATER QUALITY STANDARDS SUMMARY FOR INTERSTATE WATERS OF THE DISTRICT OF COLUMBIA.
District of Columbia Dept. of Public Health, Washington. Water Quality Control Div.
For primary bibliographic entry see Field 05G.
W72-13049

CONSUMER WILLINGNESS TO PAY FOR POLLUTION ABATEMENT,
Guelph Univ. (Ontario).
For primary bibliographic entry see Field 05G.
W72-13085

DEVELOPMENT OF GROUND WATER IN THE HOUSTON DISTRICT, TEXAS, 1966-69,
Geological Survey, Austin, Tex.
R. K. Gabrysch.
Texas Water Development Board Report 152, June 1972. 24 p, 18 fig, 3 tab.

Descriptors: *Groundwater resources, *Water wells, *Water supply, *Hydrogeology, *Texas, Aquifer characteristics, Pumping, Withdrawal, Water yield, Water quality, Salinity, Water level fluctuations, Drawdown, Hydrologic data, Water utilization.
Identifiers: *Houston (Tex).

Total withdrawals of groundwater in the Houston, Texas, district increased from about 412 mgd in 1966 to 507 mgd in 1969. Almost all of the increase occurred in the Daty, Pasadena, and Houston areas. Pumpage in the Nasa area has become significant in the past few years, increasing from 5.3 mgd in 1966 to 11.2 mgd in 1969. Small increases occurred in the Baytown-La Porte and Texas City areas, but pumpage remained almost constant in the Alta Loma area. Water-level declines continued, generally, at a greater rate than before 1966. The greatest declines in the past several years were in the Houston area, but the center of decline is still in the Pasadena area. Although saltwater encroachment is probable in the district, no large increases in chloride were measured at the monitoring points. (Woodard-USGS)
W72-13264

AN ANALYSIS OF THE DEMANDS FOR WATER FROM THE PRIVATE SECTOR IN A SUB-ARCTIC URBAN AREA,
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 06C.
W72-13298

THE INTERGRATION OF MULTIPLE OBJECTIVES IN URBANIZING WATERSHEDS,
North Carolina Water Resources Research Inst., Raleigh.
For primary bibliographic entry see Field 06B.
W72-13303

WASTE WATER RECLAMATION SYSTEM,
G. Kesselman.
U. S. Patent No. 3,550,778, 3 p, 2 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 881, No 5, p 1902, December 29, 1970.

Descriptors: *Patents, Reclamation, Water quality, Impaired water use, *Reclaimed water, *Water reuse, Recirculated water, Water treatment.
Identifiers: *Car wash installations.

The reclamation system for car wash installations comprises a catch basin for receiving waste water and a device for conducting the waste water to a lint trap. After lint removal the water is passed through a sand filter tank, a flow meter and a pair of activated charcoal filter tanks before it enters a clearwell for collecting reusable water. (Sinha-OEIS)
W72-13530

WORLD AND WATER IMPERATIVES: WORLD CITY OF THE FUTURE,
Doxiadis Associates, Athens (Greece).
For primary bibliographic entry see Field 05G.
W72-13549

WATER-CAPACITY PLANNING FOR METROPOLITAN AREAS - THE CASE OF MONROE COUNTY, N Y.,
Rochester Univ., N.Y. Center for Naval Analyses.
C. H. Piersall, Jr., and S. F. Platt.
Journal of the American Water Works Association, Vol. 63, No. 2, p 89-94, February 1971. 2 fig, 3 tab, 6 ref.

Descriptors: *City planning, *Water supply, *Water pollution, Long-term planning, Benefits, Pricing, Consolidation, *New York.
Identifiers: *Monroe County (N.Y.), *Monroe County Water Authority (MCWA), Policy making.

The case of Monroe County, New York is used to make specific proposals about problems of water supply and water pollution. The long-range water facilities construction plans of the City of Rochester and the Monroe County Water Authority (MCWA) are examined for possible net benefits from the establishment of various levels of system consolidation. After examining pricing policies the following conclusions were made: (1) the use of a 25% summer price rate differential would result in a net benefit to the region through reduced construction requirements; (2) the current methods of block pricing and the granting of quantity discounts to large users are out of line with the production and distribution costs, and a rate system that provides a fixed charge for connecting to the water system and a separate rate for usage is recommended; (3) the econometric model established that the important variables are the maximum daily flow of water, the average daily flow per zone, and the percentage of population served within the pressure zone boundaries. The adoption of the recommendations described on system consolidation and on peak seasonal pricing differential will yield net benefits to the region of $28,064,000 in 1970 dollars, which represents an amount equal to approximately two year total operating costs for both the Rochester City Water Bureau and the MCWA. Since the demand for each of the total independent water districts is incorporated in the consolidation demand, further saving will accrue when these districts are absorbed. (Strachan-Chicago)
W72-13550

CRISIS IN MUNICIPAL WATER SUPPLIES,
Taylor and Smith, San Bernardino, Calif.
E. F. Taylor.
Journal of the American Water Works Association, Vol. 63, No. 5, p 269-280, May 1971. 5 photo, 103 ref.

Descriptors: *Municipal water, *Water supply, *Water quality control, Maintenance, Financing, Law enforcement, State governments, Local governments, Planning, Legislation.
Identifiers: *Water quality improvement, Operating perogatives.

Improvement in water quality depends upon money and enforcement of laws. State laws relating to water pollution, the appropriation of water resources, and the operating perogatives of municipal water works are discussed. At least 35 states have adopted far-reaching water pollution control legislation. These state laws generally establish boards, organized on a regional basis, and charge them with developing comprehensive programs to eliminate pollution, determine permissible limits of discharges, abate pollution, and regulate any new or increased discharges under control permits. This system has failed in many instances. Specific state laws are reviewed. Cities, counties, and districts have undertaken the bulk of construction, operation, and maintenance of water quality facilities. A series of court decisions on water quality are discussed. Fixing rates, conditions for service, water contracts and conveyances, and water stock questions are examined in relation to the municipal role in maintaining water quality. (Strachan-Chicago)
W72-13553

FEDERAL ASSISTANCE IN ACHIEVING WATER UTILITY GOALS, JOINT DISCUSSION,
Department of Housing and Urban Development, Washington, D.C. Community Resources Development Administration.
For primary bibliographic entry see Field 06E.
W72-13555

FEDERAL ASSISTANCE IN ACHIEVING WATER UTILITY GOALS, JOINT DISCUSSION,
Farmers Home Administration, Washington, D.C. Community Services Div.
For primary bibliographic entry see Field 06E.
W72-13556

FEDERAL ASSISTANCE IN ACHIEVING WATER UTILITY GOALS, JOINT DISCUSSION,
Economic Development Administration, Washington, D.C.
For primary bibliographic entry see Field 06E.
W72-13557

POPULATION GROWTH AND NONINDUSTRIAL WATER POLLUTION,
For primary bibliographic entry see Field 05G.
W72-13558

COSTS AND QUALITY OF WATER IN OHIO CITIES,
Ohio State Univ., Columbus; Ohio Agricultural Research and Development Center, Columbus; and Ohio State Univ., Columbus. Dept. of Agricultural Economics and Rural Sociology.
For primary bibliographic entry see Field 05G.
W72-13561

INSTRUMENTATION FOR ENGINEERING MANAGEMENT OF A MULTI-PURPOSE RIVER BASIN SYSTEM (THE TRINITY RIVER BASIN, TEXAS),
Texas Univ., Austin. Center for Research in Water Resources.
For primary bibliographic entry see Field 04A.
W72-13609

3E. Conservation in Industry

EXTERNALITIES AND THE RACE FOR ECONOMIC GROWTH IN THE USSR: WILL THE ENVIRONMENT EVER WIN,
Wellesley Coll., Mass.
For primary bibliographic entry see Field 05G.
W72-13088

THE ECONOMICS OF GEOTHERMAL POWER,
For primary bibliographic entry see Field 06C.
W72-13092

ENVIRONMENTAL REPERCUSSIONS AND TRADE THEORY,
Michigan State Univ., East Lansing.
For primary bibliographic entry see Field 05G.
W72-13093

SALT WATER IS A MINERAL: OWNERSHIP OF A NATURAL RESOURCE OF INCREASING IMPORTANCE IN OIL PRODUCING STATES,
L. Hudson.
Texas Law Review, Vol 50, p 448-461, 1972. 62 ref.

Descriptors: *Texas, *Saline water, *Subsurface waters, *Mineralogy, Mining, Drilling, Oil industry, Saline water systems, Subsurface flow, Legal aspects, State governments, Legal review, Water law, Domestic water.
Identifiers: *Surface estate, *Mineral estate, Mineral rights.

History, legal precedent, and policy are analyzed to show why salt water should be considered as a mineral subject to ownership as such. The problems in defining salt and domestic water are analyzed. A legal distinction between surface and subsurface water is legally more significant. The historical interrelation of salt water and petroleum is traced to show that the two occur together and that in Eastern states the salt lease was the forerunner of the oil and gas lease. The construction of the phrase 'oil, gas, and other minerals' is discussed as cases have defined it. It is concluded that salt water is included in the term 'other minerals', and that the following results arise if salt water is regarded as a mineral: the confusion in cases holding that water belongs to the surface estate would be eliminated since cases holding salt water belongs to the mineral estate would be explainable; it would become readily apparent that the surface estate and not the mineral estate should lease domestic water; royalty provisions for sale of salt water would become enforceable; making salt water a mineral subjects it to the states' duty to conserve natural resources; salt water production could be taxed; and the state of Texas will be declared owner of salt water under much land. (Grant-Florida)
W72-13225

WATER FOR INDUSTRIAL DEVELOPMENT IN KEMPER, LEAKE, NESHOBA, NOXUBEE, AND WINSTON COUNTIES, MISSISSIPPI,
Geological Survey, Jackson, Miss.
R. E. Taylor, and F. H. Thomson.
Mississippi Research and Development Center Report, 1972. 63 p, 31 fig, 12 tab, 33 ref.

Descriptors: *Water resources development, *Industrial water, *Groundwater, *Surface waters, *Mississippi, Water quality, Water supply, Water utilization, Aquifer characteristics, Water yield, Pumping, Drawdown, Streamflow, Flow rates, Flow characteristics, Flood data, Hydrologic data, Data collections, Water level fluctuations, Sediment transport.
Identifiers: *Kemper County (Miss), *Leake County (Miss), *Neshoba County (Miss), Noxubee County (Miss), *Winston County (Miss).

Large quantities of water are available for industrial and other uses in Kemper, Leake, Neshoba, Noxubee, and Winston Counties in east-central Mississippi. About 7.3 million gallons per day of groundwater, a fraction of the potential yield, is presently withdrawn for industrial, municipal, and rural use. No surface-water supplies have been developed. The chemical quality of surface water is adequate to meet most industrial requirements; however, high summertime water temperatures may preclude some uses. Large quantities of water are available from Cretaceous and Tertiary aquifers. The base of fresh water ranges from about 200 feet above sea level to about 2,700 feet below sea level. Efficient wells could produce more than 2,500 gallons per minute. Regional water-level decline in the aquifers averages about half a foot per year. Groundwater of good quality is available throughout the area except in southeastern Kemper County. Water from the Cretaceous aquifers is alkaline, high in dissolved solids, and low in iron content. Tertiary aquifers contain soft acidic water, low in dissolved-solids content, and high in iron. (Woodard-USGS)
W72-13278

SAVE WATER: AIR CONDENSE STEAM,
Lummus Co., Bloomfield, N. J.
For primary bibliographic entry see Field 05G.
W72-13311

COOLING TOWER SITE CONSIDERATIONS,
Stone and Webster Engineering Corp., Boston, Mass.
For primary bibliographic entry see Field 05G.
W72-13314

THE CRISIS IN POWER-PLANT SITING,
Oak Ridge National Lab. Tenn.
For primary bibliographic entry see Field 05B.
W72-13321

NUCLEAR POWER PLANTS: FEWER AND FARTHER BETWEEN.
For primary bibliographic entry see Field 05B.
W72-13324

MANAGING THE POWER SUPPLY AND THE ENVIRONMENT.
For primary bibliographic entry see Field 06G.
W72-13332

THE WATER USE AND MANAGEMENT ASPECTS OF STEAM ELECTRIC POWER GENERATION.
National Water Commission, Arlington, Va. Consulting Panel on Waste Heat.
For primary bibliographic entry see Field 05B.
W72-13355

WASTEWATER UTILIZATION IN THE POTATO PROCESSING INDUSTRY,
Washington State Univ., Pullman. Coll. of Engineering Research Div.; and Washington State Univ., Pullman. Radioisotopes and Radiations Lab.
For primary bibliographic entry see Field 05D.
W72-13505

INDUSTRIAL WATER FORECASTS,
Hazen and Sawyer, New York.
R. H. Stewart, and I. Metzger.
Journal of the American Water Works Association, Vol. 63, No. 3, p 155-157, April 1971. 1 tab, 6 ref.

Descriptors: *Industrial water, *Forecasting, *Water resources development, Projections, Planning, Equations, Costs.

The planning of water resource developments has focused attention on the need for accurate forecasting of industrial water demands. These studies have demonstrated the differences between projection methods commonly used for the development of public water utilities and procedures appropriate for projecting industrial use. 90% of the total industrial water demands are self-supplied from private systems at relatively low cost. A forecasting method for industrial water considers factors related to industrial process water utilization in addition to measurements of production. It is considered to give more reasonable forecasts than are obtained when recirculation and technological change are neglected. The basic data required for the proposed equation can be obtained or easily developed for the employment, output, and recirculation terms. Additional research is required to establish the most probable values of the technological change term. The expected magnitude of US industrial water needs in the future indicates that substantial efforts spent to develop technology to reduce unit process-water use will benefit both industry and the general public. (Strachan-Chicago)
W72-13551

SIMULATION MODEL FOR THE ECONOMIC EVALUATION OF PUMPED-STORAGE,
Electricite de France. Paris.
For primary bibliographic entry see Field 04A.
W72-13566

ECONOMICS OF PUMPED STORAGE IN NEW ENGLAND,
Alexander Kusko, Inc., Needham Heights, Mass.; and Massachusetts Ins. of Tech., Cambridge, Mass.
For primary bibliographic entry see Field 04A.
W72-13567

ECONOMIC ANALYSIS OF SWISS PUMPED STORAGE SCHEMES FOR VARIOUS PARAMETERS OF OPERATION AND ENERGY COSTS,
Maggia, Locarno (Switzerland).
For primary bibliographic entry see Field 04A.
W72-13568

3F. Conservation in Agriculture

EFFECTS OF NONIONIC SURFACTANTS ON MONOCOTS,
California Univ., Riverside. Dept. of Plant Pathology; and California Univ., Riverside. Dept. of Soils and Plant Nutrition.
For primary bibliographic entry see Field 05C.
W72-13050

EVALUATION OF POTENTIAL BENEFITS OF WEATHER MODIFICATION ON AGRICULTURE,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 03B.
W72-13053

FINANCING IRRIGATION,
T. Milligan.
Irrigation Age, Vol 6, No 9, p 10-14, 47, 55, April 1972.

Descriptors: *Irrigation, *Irrigation programs, *Financing, Financial feasibility, Loans, Cost-benefit analysis, Water supply, Taxes, Agriculture, *Nebraska.

Nebraska has established the goal of doubling the irrigated acreage in the state by 1980. Studies have indicated that Nebraska has enough water to irrigate four times the number of acres now under irrigation. Furthermore, the state has some 19.2 million acres of land suitable for irrigation, with slightly more than 4 million acres currently being irrigated. Thus, the only major constraint facing Nebraska is a financial one; that is, the expansion will be very costly. However, a recent workshop on financing arrived at the consensus that there will be adequate money for financing private

development as long as sound propositions are presented to the lender by the landowner or tenant. Some of the factors which determine the financial soundness of an irrigation project are (1) the dependability of water supply over an extended period of time, (2) the cost of the system, including initial investment, maintenance, and operating expenses, and (3) the magnitude of the benefit-cost ratio. Tax exempt type financing may not be readily available in many areas because of the urban congressman's reluctance to help boost farm production when expanded output may not be needed. (Settle-Wisconsin)
W72-13090

COMPUTER SIMULATION ANALYSIS ON RECLAMATION OF SALT-AFFECTED SOILS IN SAN JOAQUIN VALLEY, CALIFORNIA,
California Univ., Davis.
K. K. Tanji.
Soil Science Society of America Proceedings, Vol 36, No 1, p 127-133, Jan-Feb 1972. 9 fig, 3 tab, 34 ref.

Descriptors: *Saline soils, *Leaching, *Computer models, *Simulation, Sodium, Gypsum, Boron, Land reclamation, Percolation, Field data, California, Bibliographies, Analysis, Drainage effects, Drainage.
Identifiers: *Salt removal, San Joaquin Valley (Calif.), Soluble salts.

A computer land reclamation model was applied to a field leaching study of moderately salt-affected profiles. Leaching was accomplished by ponding 15 cm of water intermittently in 3-m by 3-m basins every 1 to 2 weeks. Computer predictions on the degree of reclamation were compared with measured changes in soluble salts, soluble boron, and the sodium adsorption ratio to soil depths of 274 cm. The differences between computed and measured field data were no more than the horizontal variations found in salt-affected lands in this area and elsewhere. Predicted drainage water quality and a method for computing gypsum requirements of sodium-affected profiles are reported. Computer programming techniques provide a better understanding of the complex salt problem in irrigated lands. (USBR)
W72-13115

SOME STRUCTURAL FEATURES OF WATER IN PLANT TISSUES BASED ON INFRARED SPECTROSCOPY DATA,
Kazan State Univ. (USSR).
N. V. Sedykh.
Dokl Akad Nauk SSSR Ser Biol. Vol 198, No 4, p 951-953. 1971. Illus.
Identifiers: *Plant tissues, *Assimilation, Bean D, Hydrogen bonding, Onion M, Plants, *Infrared spectroscopy.

A detailed analysis of numerous IR absorption spectra of onion and bean tissues showed the presence of a number of special features in the balance absorption bands of tissue water in comparison with water in vitro. The results of calculating the values of the half-widths of the lines, peaks of the stretching vibrations, first overtone of deformation vibrations, and energies of the H bonds in tissue water are presented. It is concluded that water with a higher degree of structural organization should be assimilated by an organism more quickly and better than water whose structure is less ordered.--Copyright 1972, Biological Abstracts, Inc.
W72-13116

THE EFFICIENCY OF PRODUCTION OF FLOWER CULTURES BY OPEN HYDROPONICS,
N. G. Sarukhanyan, and A. K. Vartanyan.
Biol Zh Arm. Vol 24, No 3, p 30-41. 1971.
Identifiers: *Hydroponics, *Crop production, *Asparagus M, Aster D, Cultures, Dianthus caryophyllus D, Flowers, Gladiolus hybridus M, Growth, Hyacinth M, Open, Production, Reproduction, Tulip M.

Cultures of gladiolus, goldcrest, aster, common asparagus, tulip, and hyacinth were grown by open hydroponics on gravel, volcanic slag and a mixture (3:2) in a standard nutrient medium. Asparagus plants grew better under these conditions than control plants in soil. Dianthus caryophyllus Schabaut (goldcrest) also showed better growth, the number of blossoms being higher by 88%. Gladiolus hybridus had similar growth characteristics in both cases; the plants grown by hydroponics, however, were bigger. Hydroponic corms or control corms in hydroponic medium showed a higher germination rate. The reproduction period was shortened by 1-2 yr, the production of high-quality corms being preserved.--Copyright 1972, Biological Abstracts, Inc.
W72-13122

IRRIGATION OF GRAIN SORGHUM AND WINTER WHEAT IN ALTERNATING DOUBLE--BED STRIPS,
Agricultural Research Service, Bushland, Tex.
J. T. Musick, and D. A. Dusek.
Journal of Soil and Water Conservation, Vol 27, No 1, p 17-20, Jan-Feb 1972. 2 fig, 3 tab, 8 ref.

Descriptors: *Irrigation practices, *Strip cropping, *Water conservation, Irrigation, Sorghum, Wheat, Root development, Cropping patterns, Soil moisture, Crop yield, Crop production, Agriculture, Texas.
Identifiers: Water application rate.

Because of a limited ground-water supply, irrigation water and rainfall must be used most efficiently in the Texas Panhandle where a study was made over 3 crop years to determine crop yields. Growing grain sorghum and winter wheat in alternate 80-in. field strips increased grain yields about 15% with adequate irrigation. Good yields obtained with reduced water levels indicated that alternating a winter and summer crop in narrow strips can result in efficient use of water under limited irrigation. Lateral plant rooting developed completely across adjacent strips during the nongrowing period of the adjacent crop, which increased the amount of stored soil water available for plant use. (USBR)
W72-13123

POTENTIAL FOR CONTROLLING QUALITY OF IRRIGATION RETURN FLOWS,
Robert S. Kerr Water Research Center, Ada, Okla.
For primary bibliographic entry see Field 05G.
W72-13179

FLUCTUATIONS IN THE CO2 COMPENSATION POINT IN COTTON PLANTS UNDER THE EFFECT OF OSMOTIC TREATMENTS,
Office de la Recherche Scientifique et Technique Outre-Mer, Paris (France).
Anh Thu Nguyen Duc, and Da Silva Jorge Vieira.
C R Hebd Seances Acad Sci Ser D Sci Nat (Paris). Vol 273, No 15, p 1291-1294, 1971, Illus.
Identifiers: *Plant physiology, *Carbon dioxide, Moisture stress, Compensation, *Cotton D, Fluctuations, Osmotic treatment, Oxygen, Plants, Respiration.

The equilibrium between CO2 emission and its absorption in cotton which is practically constant under favorable water conditions, varies in time for water deficiencies induced by osmotic treatments. Emission prevails over assimilation: the greater the water deficiency or the longer the time of treatment, the greater this prevalence. Under the effect of osmotic treatment, photorespiration decreases and even becomes abolished in spite of an increase in CO2 emission in an atmosphere without O2.--Copyright 1972, Biological Abstracts, Inc.
W72-13245

TIME-INTEGRATED THERMAL EFFECTS OF FOREST IRRIGATION,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
For primary bibliographic entry see Field 05D.
W72-13247

EROSION OF SOME BULGARIAN SOILS BY IRRIGATION (IRRIGATSIONNAYA EROZIYA PRI SAMOTECHNOM OROSHENII NEKOTORYKH POCHV BOLGARII),
Institute of Water Engineering and Land Improvement, Sofia (Bulgaria).
For primary bibliographic entry see Field 02J.
W72-13283

WATER INTAKE RATES ON A SILT LOAM SOIL WITH VARIOUS MANURE APPLICATIONS,
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.
O. E. Cross, and P. E. Fischbach.
Paper No 72-218 presented at 1972 Annual Meeting, American Society of Agricultural Engineers, Hot Springs, Arkansas, June 27-30, 1972. 13 p, 9 fig, 4 ref. OWRR B-012-NEB (1).

Descriptors: *Irrigation practices, *Infiltration rates, Irrigation efficiency, *Fertilization, *Farm wastes, *Silts, *Loam, Soil types.

The application of manure to cultivated and irrigated soils changes the intake rate of irrigation water when compared to the intake-rate of non-manured soils. Findings of a two-year study of irrigation on manured soils are presented. The initial water intake rate increased as the quantity of manure application increased. The basic water intake rate increased as more time from date of manure application had elapsed. Manure application decreased the basic intake rate as compared to the basic intake rate of non-manured silt loam soil. Depth of plowing did not appreciably affect the basic intake rate. The intake rates are a necessary guideline for the irrigator.
W72-13295

WATER TABLE CONTROL AND SUBSURFACE IRRIGATION IN MINERAL AND HIGH ORGANIC COASTAL PLAIN SOILS,
North Carolina Water Resources Research Inst., Raleigh.
R. Skaggs, and G. J. Kriz.
Available from the National Technical Information Service as PB-211 616, $3.00 in paper copy, $0.95 in microfiche. North Carolina Water Resources Research Institute, Raleigh, Report No. 67, May 1972, UNC-WRRI-72-67, 63 p, 22 fig, 3 tab, 7 ref. OWRR-A-033-NC (3).

Descriptors: *Irrigation design, *Subsurface irrigation, *Drainage systems, *Subsurface drainage, *Soil-water-plant relationships, Surface-groundwater relationships, *North Carolina, *Water table, *Coastal plains, *Organic soils, Loam, Sands, *Hydraulic conductivity.
Identifiers: *Mineral soils.

Field experiments were conducted at three sites in the Lower Coastal Plain of North Carolina to measure the water table response to subirrigation, drainage, rainfall infiltration, and evapotranspiration. The water table response to drain tube subirrigation and drainage was determined for three drain spacings on a Lumbee sandy loam soil. Results showed that water could be supplied to the root zone at a rate more than sufficient to satisfy

plant needs for the 7.5 and 15 m but not the 30 m drain spacings. Theoretical calculations showed that the suggested water table depth range of 60 to 90 cm could be maintained in this soil with a drain spacing of 19.2 m. An equation derived to determine the upward movement of the water table during subirrigation can be used to accurately predict the water table rise midway between the drain lines except for an ititial lag period. Four theoretical equations were used to calculate drain spacings using water table drawdown rates measured in the field experiments. When the hydraulic conductivity is determined from soil cores or other independent measurements, the order of preference of the four equations is Bouwer and van Schilfgaarde, van Schilfgaarde, Glover, and Hammad. If an effective hydraulic conductivity is determined from water table drawdown measurements, the Hammad equation gives the most accurate prediction of the drain spacing. Much greater accuracy can be obtained in all of the above equations by evaluating the drainable porosity based on the initial and final water table depths rather than using a constant value.
W72-13304

STUDY ON THE VARIETIES OF WINTER AND SPRING WHEAT,
Volgorad Agricultural Inst. (USSR).
P. A. Yakhtenfel'D.
S-Kh Biol. Vol 6, No 4, p 483-489. 1971. English summary.
Identifiers: *Crop production, *Irrigation effects, Plant diseases, Fungi, Resistance, Rust, Spring, Triticum turgidum M, Varieties, Wheat-M, Winter.

Cultivars (21) of winter and spring wheat were tried under irrigation. Watering almost doubled the yield. However, under such conditions, properties as resistance to lodging and fungal diseases become more important. In the years of good winter 'Mironovskaya Yubileinaya 50' and 'Besostaya 1' winter wheat produce the best results under irrigation with regard to yield and the quality of grain. 'Mironovskaya 808' proves susceptible to lodging and rust under such conditions. It is difficult to select varieties of soft spring wheat for irrigated plantings when they have been developed for regions of arid farming. Some variations of T. turgidum as well as 'Melanopus 26' and 'Kharkovskaya 46' hard wheats look promising for irrigated farming because they are resistant to brown leaf rust and lodging and produce large high-quality grain.--Copyright 1972, Biological Abstracts, Inc.
W72-13348

REGULARITIES OF WATER EXCHANGE IN CORN UNDER OPTIMAL GROWING CONDITIONS,
Vsesoyuznyi Nauchno-Issledovatelskii Institut Kukuruzy, Dnepropetrovsk (USSR).
M. Y. Tregubenko, G. L. Filippov, and N. V. Vishnevskii.
S-Kh Biol. Vol 6, No 4, p 490-495. 1971. Illus. English summary.
Identifiers: *Crop production, *Plant physiology, *Irrigation effects, Corn M, Irrigation, Minerals, Nutrition, Respiration, Transpiration.

The water availability and the mineral nutrition of corn affect water properties of leaves, respiration and transpiration. There is more useful water in irrigated plants, and their respiration and transpiration are more intensive. Changes in the water regime of irrigated plants depend not only on the level of metabolism but also on the water regime of the soil. The intensity of respiration and transpiration are directly affected by the activity of water in leaves.--Copyright 1972, Biological Abstracts, Inc.
W72-13362

RESPONSE OF 'TAICHUNG NATIVE 1' RICE TO WATER-MANAGEMENT PRACTICES AND NITROGEN FERTILIZATION IN DRY SEASON,
Irrigation Research Centre, Sambalpur (India).
D. Lenka.
Indian J Agric Sci. Vol 41, No 2, p 166-172. 1971.
Identifiers: *Crop production, *Water conservation, Water management (Applied), Dry, Fertilization, India, Nitrogen, Rice M, Taichung Native 1.

At Bhubaneswar, 'Taichung Native 1' responded linearly up to 160 kg N/ha in the dry season. Continuous saturation of the field is as good as continuous submergence and is also most efficient. It is possible to economize water use and to increase crop yield by suitable water-management practices and fertilization. Alternate wetting and drying and high levels of N fertilization are conducive to higher yields. Deep percolation losses account for 29% of total water required in the field.--Copyright 1972, Biological Abstracts, Inc.
W72-13363

OBSERVATIONS AND GENERAL CONSIDERATIONS ON RICE GROWING IN THAILAND,
Ministry of Agriculture, Bangkok (Thailand). Rice Dept.
Tisuke Takahashi, Chob Kanareugsa, Prachern Kanchanomai, and Pratieb Krasaesindhu.
Thai J Agric Sci. Vol 4, No 2, p 105-136. 1971.
Identifiers: *Crop production, *Rice M, Thailand, Time, Transplanting.

The different dates of transplanting showed a profound influence on the plant height, maturity period and yield. Aug. or Sept. transplanting, depending on the cultivar, gave higher yields than other transplanting times, and showed a reduction in the growing period, the height of the plant and the straw/grain ratio. Split application of N was always better than basal application, and there was no significant difference between the 2 and 3-application treatments. Transplanting time affects the yield significantly in 3 locations. At Bang Khen and Rangsit, Sept. transplanting proved to be the best time. But at Chai Nat, Aug, proved to be the best time for transplanting. This was only the exception out of 9 experiments to the conclusion that the growing duration of about 5 mo. in the monsoon season is optimum for the yield. The effect of spacing on the yield is significant, but the trend varies according to location. At Bang Khen and Rangsit 20 x 20 cm spacing is better, while in the rich soils of Chai Nat there was no definite trend in favor of a particular spacing. Cultivar difference is highly significant at Chai Nat where the yield is the highest; significant at Bang Khen where the yield is moderate, and not significant at Rangsit where the yield is lowest. 'Puang Nakh 16' also responds better to top dressing and produces bigger panicles than 'Leuang Pratew.' Yields of 12 varieties were greatly dependent on the sowing time. When sown from Jan. to May, the plants did not flower and yielded no grain. Earlier sowing yielded less, the yield became increasingly higher through June, July, Aug., Sept. and Oct. when the majority of varieties attained a peak, after which the yield fell. Three seedlings per hill proved to be the best. However, more seedlings may prove better if planting time is delayed or if the varieties used produce a fewer number of tillers. A demonstration experiment was conducted in which all of the best known cultural factors were combined. The yield obtained (6256 kg clean paddy/ha at 13% moisture) is remarkable for a rainy season crop.--Copyright 1972, Biological Abstracts, Inc.
W72-13364

COMPILATION TECHNIQUES FOR MEDIUM-SCALE CADASTRAL MAPS ON HILLY TERRAIN,
For primary bibliographic entry see Field 07C.
W72-13371

SOILS IN THE FLOODPLAIN OF THE AMUR RIVER WITHIN THE UDYL-KIZINSKAYA LOWLAND,
For primary bibliographic entry see Field 02G.
W72-13372

CONTROLLING PRACTICES FOR WATER REGIME OF SANDY SOILS,
A. A. Kolosova.
Tr Novozybkovsk S-Kh Opytn Stn Vses Nauchno-Issled Inst Udobr Agropochvoved. 3. p 340-349. 1969.
Identifiers: *Crop production, *Water conservation, Soil treatment, Mulching, Irrigation, Moisture content, Oats M, Soils.

The effect of water-retaining intercalations on the moisture content of sandy soils and on the yields of some crops is presented. Yields of oats were favorably affected by irrigation, various mulching films, and water-retaining intercalations; in the variant with a cellophane intercalation (at a depth of 50 cm) the grain yield was about twice that on the control plot on which the soil was loosened to a depth of 50 cm, and 2.5 times higher than after autumn plowing.--Copyright 1972, Biological Abstracts, Inc.
W72-13375

RESEARCH ON THE EFFECT OF SOIL AND WATER CONSERVATION BY STRAW MULCH ON THE SLOPE FIELDS, (IN KOREAN),
Institute of Agricultural Engineering Utilities, Suwon (Korea).
S. K. Han, W. D. Han, and Y. W. An.
Res Rep Off Rural Dev (Korea) (Agri-Engine-Seric). 13: p 1-80. 1970. Illus. English summary.
Identifiers: *Mulching, *Crop production, Soil conservation, Water conservation, Barley M, Crops, Runoff, Slopes, Soils, Soybean D, Straw, Sweet potato D, Temperature, Wheat M.

One third to one half of the annual rainfall occurs in June and July during the harvest of barley or wheat; thus, the land is bare for several weeks before and after planting soybean or sweat potato. To prevent run-off, soil erosion and evaporation, and to insure favorable soil moisture, temperature and crop yield, straw mulch was applied to land with 5 degree, 10 degree, and 15 degree slopes.--Copyright 1972, Biological Abstracts, Inc.
W72-13376

CERTAIN PROPERTIES OF SANDY AND SANDY LOAMY SOILS IN THE MESHCHERA LOWLAND ON BINARY DEPOSITS AND THEIR AGRICULTURAL VALUE,
N. F. Ganzhara, and V. A. Devyatykh.
Dokl Mosk S-Kh Akad Im K A Timiryazev. 154. p 101-104. 1969.
Identifiers: *Soil treatment, *Crop production, Agriculture, Compost, Crops, Deficiency, Deposits, Excess, Fertilizers, Meshchera, Minerals, Moisture, Soils, USSR, Podzols.

Sod podzolic sandy and sandy loamy soils of Meshchera on fluvioglacial sands underlain by morainic loams are subject to superficial (contact) gleying and erosion. Crops grown on these soils may suffer from an excess or deficiency of moisture, depending on the frequency and quantity of atmospheric precipitation. When cultivated, the soils require bilateral moisture regulation. The application of manure-soil composts, mineral fertilizers and liming is recommended.--Copyright 1972, Biological Abstracts, Inc.
W72-13377

PHYSIOLOGICAL RESPONSES OF SORGHUM AND MAIZE LEAVES TO DROUGHT: IV. RESISTANCE OF LEAF TISSUES TO DEHYDRA-

TION BY DETERMINING SUBLETHAL WATER DEFICIENCIES,
Consejo Superior de Investigaciones Cientificas, Madrid (Spain). Instituto de Edafologia y Biologia Vegetal.
M. F. Sanchez-Diaz, M. Morey, and F. Gonzalez-Bernaldez.
Ad Edafol Agrobiol. Vol 29, No 3/4, p 265-276. 1970. Illus. English summary.
Identifiers: *Plant physiology, *Drought resistance, Air, Deficiencies, Dehydration, Droughts, Elongation, Flow, Leaves, Maize M, Permeability, Photosynthesis, Porometers, Resistance, Soils, Sorghum M, Tissues, Transpiration, Hydrogen ion concentration.

No significant differences of water loss (measured by weighing the posts) between the 2 species were detected. A similar result was obtained for leaf elongation as a function of soil pF. In both experiments the soil was fully permeated by the roots and it seems that water movement through the soil was the controlling factor. Under field conditions, with much more extensive root development, differences between the 2 spp. may occur. The determination of an average pF for the whole root system is very difficult. For a pF = 3.15 the transpiration of the stressed plants was only 50% of the controls. Leaf elongation shows a similar response, becoming 50% of the control for a pF from 2.8 to 3.0. In experiments with air flow porometers and varying soil pF, significant differences between the 2 spp. were found. Maize leaf permeability begins to decrease for pF values lower than for sorghum (pF from 2.8 to 3.2 for maize and 3.6 for sorghum). On the other hand, a sudden increase in permeability of maize leaves occurs at the end of the drought period. These results are supported by the trend of the water losses from cut leaves as a function of leaf water deficits. Sorghum loses much more water than maize. Under comparable conditions, normal watered sorghum leaves transpire from 2-3 times more than maize leaves. The water loss regulation mechanisms begin to operate in maize for stress levels lower than in sorghum. It seems that the adjustment of the transpiration decrease mechanisms to water supply and transport capacity have an adaptative significance. Sorghum plants may 'risk' higher internal water deficits than maize, but have a more continuous photosynthesis. Sublethal water deficits and tissue resistance to desiccation seem to be very similar in both species, indicating that the differences between them are not of the 'protoplasmic' type. Morphological data seem to indicate that the different soil exploration of the 2 plants caused their different behavior under drought conditions. However, this factor is reflected in the differences in leaf response, which show a coupling to the water supply to which the species is adapted. These differential leaf responses are not the 'cause' of the increased drought resistance of sorghum.--Copyright 1972, Biological Abstracts, Inc.
W72-13380

TILLAGE OF SOIL FOR EROSION CONTROL AS A DROUGHT CONTROL MEASURE,
I. G. Zinchenko.
Tr Vses Nauchno-Issled Inst Zernovogo Khoz. 3, p 67-71. 1970.
Identifiers: Agriculture, *Water conservation, *Cultivation, Accumulation, Erosion control, Droughts, Erosion, Moisture, Soils, Spring, Wheat M.

Primary cultivation of fallow and underwinter fallow with flat-cutting implements (deep digger and subsurface tiller) protects the soil against wind erosion and facilitates spring moisture accumulation in soil, making for better yields of spring wheat on the southern calcareous chernozems in northern Kazakhstan.--Copyright 1972, Biological Abstracts, Inc.
W72-13382

INFILTRATION PROPERTIES OF SOILS ON THE NORTHERN SLOPE OF TRANSILI ALA--TAU AND THE EFFECT OF MAN'S ECONOMIC ACTIVITIES,
For primary bibliographic entry see Field 02G.
W72-13383

SOILS OF THE GLENAVY-WILLOWBRIDGE DISTRICT, SOUTH CANTERBURY, NEW ZEALAND, AND THEIR SUITABILITY FOR IRRIGATION,
Department of Scientific and Industrial Research, Christchurch (New Zealand). Soil Bureau.
For primary bibliographic entry see Field 02G.
W72-13386

EFFECT OF SOIL TYPE AND IRRIGATION METHOD ON LATERAL MOVEMENT OF CYCLOATE,
Oregon State Univ., Corvallis. Dept. of Farm Crops.
For primary bibliographic entry see Field 05B.
W72-13388

NUTRITION AND BLOSSOM-END ROT OF TOMATOES AS INFLUENCED BY SOIL WATER REGIME,
Manitoba Univ., Winnipeg. Dept. of Soil Science; and Manitoba Univ., Winnipeg. Dept. of Plant Science.
C. F. Shaykewich, M. Yamaguchi, and J. D. Campbell.
Can J Plant Sci. Vol 51, No 6, p 505-511. 1971.
Identifiers: *Soil-water-plant relationships, *Soil moisture, Lycopersicon esculentum D, Nutrition, Rot, Soils, *Tomatoes D, *Moisture stress.

Two cultivars of tomatoes (Lycopersicon esculentum), 'Moreton hybrid' and 'Cardinal hybrid', were grown under greenhouse conditions on Riverdale clay and Oakville clay loam soils. The 3 water regimes used were field capacity, field capacity to 50% available water depletion, and 1/2 of the soil varying between field capacity and wilting percentage with the other half maintained at the wilting percentage. Increased soil water stress increased N and decreased P concentration in plant tissue. Concentrations of K, Na, Ca, and Mg were not significantly affected. The change in nutrient concentration increased with severity of water stress. Incidence of blossom-end rot increased with increasing soil water stress.--Copyright 1972, Biological Abstracts, Inc.
W72-13394

INTERACTIONS OF LIGHT, TEMPERATURE AND MOISTURE ON TERBUTRYN TOXICITY,
Missouri Univ., Columbia. Dept. of Plant Pathology.
For primary bibliographic entry see Field 05C.
W72-13395

INFECTION OF WHEAT SEEDLINGS BY SEPTORIA NODORUM IN RELATION TO ENVIRONMENTAL FACTORS,
Manchester Univ. (England). Dept. of Cryptogamic Botany.
S. J. I. Holmes, and J. Colhoun.
Trans Br Mycol Soc, Vol 57, No 3, p 493-500, 1971, Illus.
Identifiers: *Spores, *Environmental, Humidity, Infection, Moisture, Production, Seedlings, Septoria avenae, Septoria nodorum, Septoria secalis, Septoria tritici, Soils, Temperature, Wheat M.

A technique for the production of large quantities of spores of Septoria nodorum is described, this technique being also suitable for inducing copious sporulation of S. tritici, S. avenae and S. secalis. In glasshouse experiments very favorable conditions for infection of wheat coleoptiles by S. nodorum are provided in dry soil at a temperature of 12C. Wetter soils and temperatures of 8 or 17C permit the occurrence of less infection. Pycnidia were frequently produced on diseased coleoptiles in the glasshouse when high air humidities were provided after infection had occurred. Cultivars probably differ in their reaction to S. nodorum in the seedling stage. 'Cappelle-Desprez' was very susceptible.--Copyright 1972, Biological Abstracts, Inc.
W72-13399

CERCOSPORA LEAF SPOT EPIDEMICS ON SUGARBEETS IN THE TEXAS-NEW MEXICO HIGH PLAINS,
Texas A and M Univ., College Station. Dept. of Plant Sciences.
E. P. Van Arsdel, T. W. Jares, and Robert F. Ginn.
Plant Dis Rep, Vol 55, No 12, p 1073-1076, 1971, Illus.
Identifiers: *Fungi, *Sugar beets, *Crop production, Beta vulgaris D, *Cercospora beticola, Diurnal, Epidemics, Humidity, Moisture, New Mexico, Temperature, *Texas.

A major epidemic of Cercospora beticola on Texas-New Mexico High Plains sugarbeets (Beta vulgaris) was concurrent with a reduction in sugar content from 13 to 8% where 12% was the minimum marketable content in 1969. During 1970 Cercospora infections could be detected previsually by false color IR photography; however, this was too late to inaugurate a spray program to protect the crop with the protective fungicides currently in use. The fungus was present in sufficient quantities to start an epidemic whenever the weather was favorable. Although irrigation water could augment local dew and high humidity, the development of an epidemic was dependent upon rainfall for sufficient moisture. In the High Plains the reduction in diurnal temperature range which accompanied cloudy, rainy weather was also necessary to produce temperatures favorable for the development of an epidemic. Sugarbeet production started in 1964, and epidemics occurred in 1966 and 1969. These 2 yr were the only ones, of the last 10, which had 10 or more rainy days in Aug. and Sept. at most stations. The rainfall varied widely among 8 local weather stations, but the temperature parameters were more consistent. The reduction in the diurnal temperature range was roughly proportional to the amount of available moisture; hence, the weather favorable to Cercospora epidemics was best predicted by correlation with the least diurnal temperature range. The 1969 epidemic year had the warmest night temperatures in both Aug. and Sept. of any of the last 10 yr.--Copyright 1972, Biological Abstracts, Inc.
W72-13400

HYGIENIC EVALUATION OF THE APPLICATION CONDITIONS OF HERBICIDES IN RICE GROWING,
Vsesoyuznyi Nauchno-Issledovatelskii Institut Gigieni i Toksikologii Pestitsidov, Kiev (USSR).
For primary bibliographic entry see Field 05B.
W72-13408

DRAINAGE AND LEACHING OF SALINIZED SOIL ON THE GARIEP IRRIGATION SETTLEMENT,
A. Streutker.
Agrochemophysica. Vol 2, No 2, p 23-31. 1970. Illus. English summary.
Identifiers: Africa, *Cotton D, *Drainage, Irrigation, *Leaching, Pipes, Soils, *Saline soils, Tiles, Drains.

Cotton plants on the Gariep irrigation settlement were seriously affected by a high concentration of salts in the soil, the result of capillary movement from a water table within 150 cm from the surface. Underground drains were installed near the foot of the terrace wall, where these saline spots occurred. These drains were made of clay tiles, per-

forated pitch fiber pipes and perforated polyvinylchloride pipes wrapped in a filter of fiberglass. An area of 7 ha was planted to cotton and leached with irrigation water. After 12 irrigations, totalling 180 cm of water, the soluble salts were leached from the soil profile to a depth of 120 cm; the subsurface drains lowered the water table, controlled it at a depth of 150 cm or more below the surface, and were not silted. The creep strain of the drain pipes at a depth of 150-180 cm below the surface was 0%, 1% and 7% for the clay tile, the PVC-pipe and the pitch fiber pipe respectively; all these pipes can thus be recommended for drainage purposes. The fiberglass silted up seriously, but still performed satisfactorily in conducting the groundwater into the drain. For 3 seasons a uniform stand of cotton plants was obtained. To prevent a shallow water table and salinization of the soil, a large difference in height between adjacent terraces should be avoided.--Copyright 1972, Biological Abstracts, Inc.
W72-13422

THE INFLUENCE OF SOIL TEMPERATURE ON THE CHEMICAL KINETICS OF FLOODED SOILS AND THE GROWTH OF RICE,
International Rice Research Inst., Los Banos, Laguna (Philippines).
For primary bibliographic entry see Field 02G.
W72-13430

NON-PREPARED SOWING CULTURE OF ITALIAN RYEGRASS ON THE SEMI-IL-L-DRAINED PADDY FIELD IN A SNOWY DISTRICT,
Ministry of Agriculture and Forestry, Takada (Japan). Hokuriku Agricultural Experiment Station.
T. Takeuchi, and T. Hashimoto.
Bull Hokuriku Agric Exp Sta. 11, p 83-123. 1970. English summary.
Identifiers: *Sowing culture, Drainage, *Fertilization, Germination, Grass M, Japan, Snow, Crop yield, *Ryegrass.

In the Hokuriku districts the production of fodder by cultivating the second crop on the paddy field is very important. Before planting rice, slaked lime was added to the paddy field to neutralize the soil acidity for the second crop. This resulted in increased yields of Italian ryegrass. The use of sowing germinant seed brings about high germination rates, good growth and high yield, due to increased height of grass, and increased numbers of main stems. The yield was increased for Italian ryegrass by fertilizing with excess N. For Italian ryegrass the N fertilizer is mainly added at the sowing time. If it is fertilized before the middle of Sept., comparatively heavy fertilization is possible, but if later, fertilization may be fruitless and may accelerate snow damage. If the sowing is finished by the beginning of Sept., harvesting within the same year may be possible and the plants may survive the winter even in a very snowy year. Sowing in Oct. results in snow damage and abundant weeds. Fertilization should be made before the sowing. When Italian ryegrass is mowed, much of the total available carbohydrate (TAC) is consumed for 5-10 days for regrowth. In Nov., it can restore within 2-3 wk but in Dec. the restoration requires longer. In some cases, before being completely restored, it is covered by continuous snow and markedly damaged. Mowing in fall should be ended 1 1/2 mo. before the 1st day of continuous snow cover. TAC content in stubble was higher than in leaves and the N content of leaves was higher than in stubble. The relation between TAC and total N in stubble showed a highly negative correlation, showing much TAC and less total N in the case of little snow damage, and less TAC and much total N in the case of great snow damage. TAC and dry matter ratio in stubbles showed a highly positive correlation.--Copyright 1972, Biological Abstracts, Inc.
W72-13436

ELECTRONIC MEASURING DEVICES IN AGROPHYSICAL INVESTIGATIONS (IN RUSSIAN),
Agrofizicheskii Nauchno-Issledovatelskii Institut, Leningrad (USSR).

SB. TR. Po Agron. F12.25, 220 p. Leningrad, 1970.
Identifiers: *Electronic equipment, *Measurement, *Plant growth, *Agriculture, Instrumentation.

Results are summarized of investigations carried out by the laboratory for methods and devices for obtaining information in plant growing and agriculture, based on data relating to development of blocks and assemblies of electron measuring devices, theory of instruments and measuring systems for agrophysical investigations and system for regulation of conditions and environments.--Copyright 1972, Biological Abstracts, Inc.
W72-13486

AEROBIC TREATMENT OF FEEDLOT RUNOFF,
Nebraska Univ., Lincoln. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05D.
W72-13517

AEROBIC TREATABILITY OF FEEDLOT RUNOFF,
Nebraska Univ, Lincoln.
For primary bibliographic entry see Field 05D.
W72-13518

AEROBIC TREATMENT OF FEEDLOT RUNOFF.
Nebraska Univ., Lincoln.
For primary bibliographic entry see Field 05D.
W72-13519

THE IMPACT OF PUBLIC WORKS SCHEMES ON FARMING: A CASE STUDY RELATING TO A RESERVOIR AND POWER STATION IN NORTH WALES,
University Coll. of Wales, Aberystwyth.
W. D. Jones.
Journal of Agricultural Economics, Vol 23, No 1, p 1-13, 1972.

Descriptors: *Reservoirs, *Nuclear powerplants, *Construction, *Economic impact, Social impact, Agriculture, Farms, Employment, Income.
Identifiers: *North Wales (Great Britain).

The economic effects on farming of building a reservoir and an atomic power station in two rural areas in North Wales is studied. The study spans a ten-year period beginning with the commencement of construction work on the Atomic Power Station in 1958 and ending with completion of the Station and the reservoir in 1968. By the end of this period, the farmers who remained in the area were becoming accustomed to their new farming circumstances and environment. The economic impact on farming was found to depend on many factors, the most important of which are (1) the nature of the construction work and of the building, industry, or service resulting from it; (2) the area and quality of the land acquired by the public agency; (3) the general structure of agriculture in the vicinity, including the systems of production employed; (4) the thriftiness of the farmers; and (5) the specific problems associated with farming in the affected areas. An important conclusion arising from this study is that the methods of assessing the value of land acquired compulsorily and the amount of compensation payable for disturbance need to be more closely related to economic and social realities. (Settle-Wisconsin)
W72-13560

04. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control of Water on the Surface

A WIDE-AREA INVESTIGATION OF WATER UTILIZATION--PRIMARY REPORT.
Ministry of Construction, Tokyo (Japan). River Bureau.
For primary bibliographic entry see Field 06D.
W72-13054

FLOOD DAMAGE PREVENTION POLICIES,
Chicago Univ., Ill. Dept. of Geography.
G. White.
In: Natural Resources Forum, United Nations, Dept. of Economic and Social Affairs, Vol I, p 39-45, 1971. 1 tab, 19 ref.

Descriptors: *Floods, *Flood plains, *Flood damage, Flood protection, *Flood control, Flood plain insurance, Forecasting, Cost-benefit analysis.

In using areas subject to overbank flooding, man may adjust to the hazard of flood loss in any of three ways. He may (1) change the flood, (2) distribute flood losses, or (3) arrange his use so as to change the losses. In the past, the most common adjustments sponsored by governments were concerned with altering the stream channel. However, a review of recent programs and legislation in a number of countries indicates that several new trends for dealing with flood losses may be emerging. First, more precise and comprehensive systems for forecasting floods are being installed. For the forecasting systems to be of maximum value, they must be linked with effective warning systems. Second, flood plains are being delimited so that potential users may be aware of the risks of locating at any particular location in the flood plain. Third, flood control projects such as dams are being integrated with other measures for river basin development. Fourth, advancements are being made in the use of cost-benefit and cost effectiveness studies. Fifth, there is an increasing reliance on a policy mix for distributing losses. The application of these new approaches may be particularly appropriate in developing countries. (Settle-Wisconsin)
W72-13074

OPTIMIZATION MODEL FOR CHURCHILL RIVER DIVERSION,
Metcalf and Eddy, Inc., Boston, Mass.
Abu M. Z. Alam.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 98, No HY8, Paper 9089, p 1351-1366, August, 1972. 4 fig, 9 ref, 2 append.

Descriptors: *Diversion, *River systems, *Reservoirs, *River flow, Optimization, Linear programming, Algorithms, Mathematical models, Operations research, Constraints, Digital computers, Hydrology, Elevation, Low flow, Storage, Volume, Gravity, Costs, Canada.
Identifiers: Linear algebraic equations, Nonlinear algebraic equations, Mathematical programming, Separable programming technique, Capacity, Operating storage volume.

A mathematical model is developed to ascertain optimal operating costs and project configurations for diverting flow at various rates from the Churchill River basin into the Nelson River basin in Canada, under various physical, hydrologic, and economic constraints. It is a storage and diversions scheme for augmenting dry season flows; the

minimum and maximum operating levels of the reservoirs determine the firm diversion capability and the operating storage volume. Costs of development and resource losses are also dependent directly on these levels. In the optimization problem these are, therefore, considered decision variables. All nonlinear functions are transformed into piece-wise linear functions preserving all essential nonlinear features. The stochastic nature of the inflow is approximated by a deterministic analysis. The Separable Programming algorithm of MPS/360 is used to perform the actual optimization. Presented is the determination of costs of optimum developments of storages and diversion flows from three interconnecting reservoirs, with consideration of all interests affected by the development of the reservoirs. Each solution indicates the combination of diversion routes and storage ranges in the three reservoirs for a firm capability and storage as required by the total Manitoba Hydro system operation. (Bell-Cornell)
W72-13134

OPTIMAL SEASONAL AND SHORT-TERM OPERATION OF A RESERVOIR USED FOR FLOOD CONTROL AND WATER SUPPLY,
Water Research Association, Marlow (England).
J. A. Cole.
Paper, presented AIHS--IASH, International Symposium on Mathematical Models in Hydrology, Warsaw, Poland, July 26-31, 1971. 14 p, 5 fig, 1 tab, 6 ref, append.

Descriptors: *Dynamic programming, *Flood control, *Reservoir operation, *Multi-purpose reservoirs, Optimization, Costs, Mathematical models, Water deficiencies, Water supply, Storm runoff, Equations, Downstream, Low flow, Storage, Water demand, Stormwater, Spillways, Pipelines, Seasonal, Cities, Inflow, Forecasting.
Identifiers: Cost minimization.

Starting from a long-term objective of minimizing the combined costs of water-supply deficiencies and of downstream flood damage, the monthly release rules of a reservoir are found by dynamic programming. Examples are presented of how the rules may depend on prevailing contents and the previous monthly inflow. Methods of taking prior inflow into account, without having any significant increase in the problem's dimensions, are tested. Computational efficiency is enhanced by limiting the number of decision states. Given the seasonal values of each contents state, resulting from the dynamic programming calculation, it is then shown how short-term regulation of the reservoir contents may be decided, using a quantitative forecast of storm runoff. (Bell-Cornell)
W72-13139

THE HYDROLOGICAL ROLE OF FORESTS OF THE LITHUANIAN SSR,
G. Pauliukevicius.
Geogr Ezheg Geogr O-Va Lit SSR. 10. 83-90. 1969.
Identifiers: *Forest management, *Water conservation, Cover, Evaporation, Forests, Hydrology, Larch G, Lithuanian SSR, Moisture, Plants, Precipitation, Soils, Spruce G.

The relation between the forest cover percentage and the amount of precipitation is shown. Pure spruce forests retained 40% of the annual rate of precipitation and reduced the height of flood waters in the river basins. The interrelationship is given between the moisture deposits in the soil, the total evaporation, the amount of precipitation and the degree of anthropogenic influence. Much moisture is expended by larch stands. In the southeastern part of Lithuania a linear relationship exists between the river discharge and the forest-cover percentage of the basins. The role of forests in water conservation and the values of the optimum forest-cover percentage are given.--Copyright 1972, Biological Abstracts, Inc.
W72-13158

GENERAL PLAN 2020, LAND USE GUIDE FOR WATER, WASTE WATER AND DRAINAGE ENGINEERING STUDIES, MID-HUMBOLDT COUNTY URBAN PLANNING PROGRAM.
Baruth and Yoder, Walnut Creek, Calif.
For primary bibliographic entry see Field 06D.
W72-13160

STORM DRAINAGE, MID-HUMBOLDT COUNTY URBAN PLANNING PROGRAM.
Baruth and Yoder, Walnut Creek, Calif.

Available from the National Technical Information Service as COM-72-10378, $3.00 in paper copy, $0.95 in microfiche. Humboldt County Planning Commission, Eureka, California, April 1971. 125 p, 22 fig, 21 tab. LPO-P/360-CAS-1.

Descriptors: *Drainage programs, *Drainage systems, *Surface drainage, *Urban drainage, *Planning, Runoff, Rainfall-runoff relationships, Storm runoff, Runoff forecasting, Runoff coefficient, Rational formula, Drainage engineering, Long-term planning, Sewerage, Sewers, Drains, California.
Identifiers: *Humboldt County (California).

Storm drainage was studied for the western midportion of Humboldt County, extending 34 miles along the Pacific Coast and about 15 miles inland. The primary objective is the development of a long-range plan for storm drainage to assure proper development and orderly growth of the Study Area. A second objective is that of correcting any deficiencies that exist in the present system so that these facilities may be integrated into the long-range plan; and the third objective is to formulate a sound financing program wherein sufficient funds will be available when the proposed facilities are required. A complete system of storm drainage facilities was developed for all areas for which development now exists, or is anticipated, within the Study Area. In addition to these proposed improvements, additional improvements could be made to Salmon Creek, Elk River, Freshwater-Ryan Creeks, Jacoby Creek, and Little River to confine the runoff and limit flooding. Two methods for computing peak discharge from a given watershed were used. For the smaller watersheds with tributary areas less than five square miles, the conventional method was followed using the Rational Formula. For the larger watersheds, the Soil Conservation Service method was used for computing flood hydrographs. Where stream flow records were available, flood magnitude-frequency relationships were examined and compared with computer flood hydrographs. General recommendations are presented for ameliorating and preventing drainage problems. Specific recommendations are given for drainage improvements in all parts of the study area. Financial and administrative considerations are included. (See also W72-13160) (Poertner)
W72-13162

FLOW UNDER A WEIR ON SOIL UNDERLAIN BY SLOPING IMPERVIOUS LAYER,
Indian Inst. of Science, Bangalore. Dept. of Civil and Hydraulic Engineering.
For primary bibliographic entry see Field 02G.
W72-13199

MISSISSIPPI RIVER, EAST BANK, WARREN TO WILKINSON COUNTIES, MISSISSIPPI (NATCHEZ AREA) (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Vicksburg, Miss.
For primary bibliographic entry see Field 08A.
W72-13217

CALIFORNIA WATER PROJECT,
California State Dept. of Water Resources, Sacramento.
W. R. Gianelli, and R. B. Jansen.
Civil Engineering, ASCE, Vol. 42, No. 6, p 78-84, June 1972, 2 fig., 2 tab.

Descriptors: *Water supply, Resources development, *Water conveyance, Recreational facilities, *Design, *Distribution systems, *California, *Utilities, *Water transfer.

The 2.3 billion dollar California Water Project, the largest public works project ever undertaken in one state, carries surplus water from Northern California to water-short Central and Southern California. Its major elements include 22 dams, 6 powerplants, 23 pumping facilities and nearly 700 mi (1126 km) of conveyance systems. Earthquake vulnerability and subsistence on arid slopes posed challenging construction problems. The entire network is coordinated by a control system which monitors water level and flow data, and converts information into a coded format for computer use. Extensive recreational facilities are an environmental by-product of this project. (Bean-AWWARF)
W72-13259

UNCONFINED AQUIFER AND SLOW DRAINAGE,
Birmingham Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 02F.
W72-13269

SOIL-RECLAMATION STUDIES IN THE POLISH PEOPLE'S REPUBLIC (POCHVENNO--MELIORATIVNYYE ISSLEDOVANIYA V POL'SKOY NARODNOY RESPUBLIKE),
J. Ostrowski.
Pochvovedeniye, No 12, p 116-126, December 1971. 2 tab, 20 ref.

Descriptors: *Land management, *Land reclamation, *Drainage, *Soil classification, Soil groups, Soil types, Soil investigations, Soil surveys, Mapping, Soil profiles, Soil properties, Soil texture.
Identifiers: *Poland, *Soil maps, Soil productivity ratings, Soil-use capability, Drainage requirements.

Improvement of the water and air regime of soils by drainage is a basic soil-management practice in the Polish People's Republic. Subsurface drainage by use of tile drains has been practiced extensively in the Republic since the 19th century. According to 1970 figures released by the Ministry of Agriculture, drainage improvement currently involves 4.3 million ha of plowland and 2.8 million ha of meadow land, which represents 62% and 67%, respectively, of the total area of these lands in need of drainage. Procedures and techniques for soil-reclamation projects in the Republic are described together with a method for determining drainage requirements of plowed soils, based on soil morphological, chemical, and physical characteristics, including horizon arrangement, texture, structure, consistency, salinity, and soil moisture-holding capacity. (Josefson-USGS)
W72-13282

CONTROLLING WATER INFILTRATION IN BIMODAL POROUS SOILS: AIR-EARTH INTERFACE CONCEPT,
Agricultural Research Service, Reno, Nev.
For primary bibliographic entry see Field 02G.
W72-13289

CONTROL OF WATER MILFOIL IN WISCONSIN,
Wisconsin Univ. Center, Marinette.
For primary bibliographic entry see Field 05C.
W72-13291

A PILOT PROGRAM TO DETERMINE THE EFFECT OF SELECTED NUTRIENTS (DISSOLVED ORGANICS, PHOSPHORUS, AND NITROGEN) ON NUISANCE ALGAL GROWTH IN AMERICAN FALLS RESERVOIR,
Idaho Univ., Moscow. Water Resources Research Inst.
For primary bibliographic entry see Field 05C.
W72-13300

SIMULATION MODEL FOR THE UPPER WABASH SURFACE WATER SYSTEM,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
G. H. Toebes, and T. P. Chang.
Available from the National Technical Information Service as PB-211 613, $3.00 in paper copy, $0.95 in microfiche. Indiana Water Resources Research Center Technical Report No. 27, July 1972. 100 p, 31 fig, 13 tab, 91 ref, 3 append. OWRR-A-012-IND (3) and A-016-IND (1).

Descriptors: *Model studies, *Reservoir operation, *Water storage, *Flood control, *Reservoir releases, Hydrologic models, *Simulation analysis, Reservoirs, Reservoir management, *Computer models, *Indiana.
Identifiers: *Wabash River Basin (Ind).

The construction of a digital regional reservoir-river simulation model is described. Simulation as a systems analysis tool is discussed in an introductory way. A comparative discussion of river routing models is given. The best selection of local routing coefficients is discussed when based only on daily flow data. The problems posed by not using precipitation data are stated. The model simulates the authorized surface water management plans and existing reservoir operating policies for the 8,000 square mile Wabash River Basin upstream of Williamsport, Indiana. It is used in testing systems operating policies for the upper Wabash Basin.
W72-13301

THE INTERGRATION OF MULTIPLE OBJECTIVES IN URBANIZING WATERSHEDS,
North Carolina Water Resources Research Inst., Raleigh.
For primary bibliographic entry see Field 06B.
W72-13303

WATER TABLE CONTROL AND SUBSURFACE IRRIGATION IN MINERAL AND HIGH ORGANIC COASTAL PLAIN SOILS,
North Carolina Water Resources Research Inst., Raleigh.
For primary bibliographic entry see Field 03F.
W72-13304

HYDROLOGIC INFORMATION STORAGE AND RETRIEVAL SYSTEM (HISARS) REFERENCE MANUAL,
North Carolina Water Resources Research Inst., Raleigh.
For primary bibliographic entry see Field 07C.
W72-13308

STREAMFLOW REGULATION BY ARTIFICIAL RECHARGE FED FROM UPSTREAM SURFACE STORAGE: DERIVATION OF CONTROL RULES,
Water Research Association, Marlow (England).
For primary bibliographic entry see Field 06A.
W72-13356

A STORAGE MODEL IN WHICH THE NET GROWTH-RATE IS A MARKOV CHAIN,
Michigan State Univ., East Lansing. Dept. of Statistics, and Probability.
For primary bibliographic entry see Field 06A.
W72-13358

A LINEAR PROGRAMMING FORMULATION OF A WATER SUPPLY PROBLEM,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Industrial Engineering and Operations Research.
For primary bibliographic entry see Field 06A.
W72-13359

COMPUTER TECHNIQUES FOR WATER-DISTRIBUTION ANALYSIS,
Becher-Hoppe Engineers, Inc., Schofield, Wis.
For primary bibliographic entry see Field 06A.
W72-13361

CONTRIBUTION TO THE BOTANY OF THE TARAI FORESTS OF THE BAHRAICH DISTRICT OF UTTAR PRADESH,
Botanical Survey of India, Allahabad. Regional Circle.
G. Panigrahi, A. N. Singh, and O. P. Misra.
Bull Bot Surv India. Vol 11, No 1/2, p 89-114. 1969.
Identifiers: Aegle D, Botany, *Forests, Grass M, *India, Savanna, Species, Tarai forests, Terminalia D, Uttar Pradesh.

Three collecting types yielded 530 spp. of angiosperms and 14 spp. of pteridophytes. An outline is presented of the 3 classes of forest types sal, miscellaneous and grass and an analysis of the floristic composition in the Katarniaghat-Dharmanpur-Motipur-Doba-Chakia-Chardha and Bhinga forests which are isolated blocks separated by 8-16 km by intervening tracts of cultivation and grazing grounds, except the forests of Dhramanpur and Motipur, which adjoin. The sal forests are divided into moist (Gangetic) high level alluvial, dry (Gangetic) alluvial, moist (Gangetic) low level alluvial, dry (Gangetic) alluvial subtypes; the miscellaneous forests are subdivided into North-Indian Moist Terminalia, cane brakes, tropical valley freshwater swamp, Khair-babul, Khair-sissoo, North dry-mixed deciduous, Aegle and Ganetic saline scrub; the Grasslands belonging to the lower alluvial moist savanna type and extending over about 3700 acres, represent the largest of the forest sub-types. The richness of the grass in the savannah is not due to the large number of different species in the area, but due to the distribution of some species over more stable riverain flats, which are subject to occasional floods and are locally known as 'phantas.'--Copyright 1972, Biological Abstracts, Inc.
W72-13365

THE DISTRIBUTION OF FOREST AND BOG VEGETATION ACCORDING TO LANDSCAPE--GEOMORPHOLOGICAL COMPLEXES AND THE RELIEF ON THE TAVDA-KONDA INTERFLUVE,
V. I. Makovskii, and Z. I. Sinel'Shchikova.
Tr Inst Ekol Rast Zhivotn Ural Fil Akad Nauk SSSR. 67, p 101-116. 1970.
Identifiers: *Geomorphology, *Vegetation, Bilberry D, Birch D, Bogs, Distribution, Forests, Grass M, Interfluve, Landscape, Linden D, Moss, Pine G, Sedges M, Spruce G, Tavda-Konda, USSR.

Four principal geomorphological complexes were distinguished: the present-day valley of the Tavda River (floodplain and the low terraces above the floodplain); the ancient high terraces above the floodplain of the Tavda and Pra-Tavda rivers; the plains of the Tavda-Kuma and Kuma-Konda divides; and the high terraces of the Konda River. Inherent in each of these complexes are definite forest formations and associations. In the Tavda valley about 77% of the territory is occupied by pine forests (chiefly bilberry and moss-linden types), about 10% are birch forests (grass-mixed herbage, smallreed-sedge types), and about 11% are peat bogs (predominantly sedge types originating from lakes). On the terraces above the floodplain the forests are represented chiefly by moss-linden pine forests (60% of all the forested territory), but dark coniferous spruce forests are also found (10-12%); most of the territory is covered by unforested lowland bogs. Dark coniferous forests predominate on the divides (on the crests and drained slopes); on the entire central part of the plain of the divide there are peat banks and bog pools. The ise of surveyors' transits is recommended for newly reclaimed areas which are of difficult access.--Copyright 1972, Biological Abstracts, Inc.
W72-13387

CHEMICAL CONTROL OF CATTAIL, TYPHA LATIFOLIA,
Alberta Univ., Edmonton. Dept. of Plant Science.
W. G. Corns, and R. K. Gupta.
Can J Plant Sci. Vol 51, No 6, p 491-497. 1971.
Identifiers: *Weed control, Chemcontrol, Amitrole, Atlox, *Cattail M, Dalipon, Diesel oil, *Herbicides, Surfactants, Tandex, Typha latifolia M.

Foliar sprays of 22.4 kg/ha Tandex in 3368 l/ha of aqueous carrier containing 1% Atlox 210 surfactant, applied at, or soon after the flowering stage of cattail (Typha latifolia L.), kept plots free of all growth for a 3 yr period. Comparable soil treatments with pelleted material were as effective only on areas that had no surface water. Foliar sprays with 16.8 kg/ha amitrole or 22.4 kg/ha dalapon were excellent for 2 yr control of cattail but allowed invasion of other weeds. Single annual foliar applications of 6.7 kg/ha 2,4-D ester with added surfactant and 112.3 liters/ha diesel oil, in 3368 l/ha total volume, were effective for cattail control. There was no appreciable advantage from higher dosages. Results from amitrole, dalapon, paraquat and Tandex, used alone, were at least as good as they were from certain mixtures of each of these herbicides with 2,4-D formulated to give the same total respective dosage. Mowing 7 times between July, 1968, and Aug., 1969, of plots not in water, reduced their cattail population by 90%. There was no apparent effect on biological activity of sewage lagoons from repeated applications of 2,4-D ester to bordering cattail, and there were no detectable residues of dalapon or amitrole in the water after treatment with these herbicides. Other chemicals were not involved in such determinations at separate lagoons.--Copyright 1972, Biological Abstracts, Inc.
W72-13431

IMPROVING PRECIPITATION-USE EFFICIENCY ON RANGELAND BY SURFACE MODIFICATION,
Agricultural Research Service, Sidney, Mont. Northern Plains Soil and Water Research Center.
J. R. Wight, and F. H. Siddoway.
Journal of Soil and Water Conservation, Vol 27, No 4, p 170-174, July-August 1972. 4 fig, 1 tab, 21 ref.

Descriptors: *Water conservation, *Consumptive use, *Grasslands, *Soil surfaces, *Range management, Contour furrows, Infiltration, Evapotranspiration.
Identifiers: *Precipitation-use efficiency, *Soil surface modification, Pitting (Soil), Scalping (Soil), Rotary subsoiling.

Five surface modification treatments-contour furrowing, pitting, scalping, miniature fallowing, and rotary subsoiling-were evaluated for their effect on precipitation-use efficiency (PUE) on rangelands in the Northern Plains. Contour furrowing, scalping, pitting, and miniature fallowing (fallow strips were allowed to revegetate) increased PUE. Improved PUE resulted from changes in soil water, species composition, and soil fertility which accompanied the surface-modification treatments. Soil-water benefits resulted primarily from increased retention of runoff and snow. On sites with low infiltration capacities, surface modification increased PUE more than 100 per-

cent. On sites with high infiltration capacities, PUE increased about 20 percent, mainly because of changes in species composition and increases in nutrient availability. (Knapp-USGS)
W72-13455

SOME PROPERTIES OF LINK MAGNITUDE FOR CHANNEL NETWORKS AND NETWORK PATTERNS,
Northwestern Univ., Evanston, Ill. Dept. of Geological Sciences.
For primary bibliographic entry see Field 02E.
W72-13458

NEW CONCEPT IN HYDROGRAPH ANALYSIS,
Nebraska Univ., Omaha. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02E.
W72-13475

SIMULATION MODEL FOR THE ECONOMIC EVALUATION OF PUMPED-STORAGE,
Electricite de France. Paris.
P. R. Gerard.
In: Pumped Storage Development and Its Environmental Effects, Proceedings of the International Conference, September 19-24, 1971, University of Wisconsin-Milwaukee, p 383-387. 5 fig.

Descriptors: *Pumped storage, *Electric power production, *Simulation analysis, Electricity, Demand, Supply, Management, Mathematical models.
Identifiers: *Electricite de France. *Probabilistic model.

To estimate the economic value of using pumped-storage, a simulation model must assess the impact on all the components of the system whose operation may be modified by the use of pumped-storage. These components include reservoir hydroplants, gas turbines, and old steam plants. Also, demand and supply variables should be treated as stochastic variables which have a known probability distribution. Simulation models can be used to test what happens (1) hour after hour in certain restrictive circumstances, or (2) month after month under less restrictive circumstances. Simulation-by-the-hour can be used to analyze the flexibility provided by a given plant. Simulation-by-the-month is necessary to plan how many plants should be scheduled, when they should be inserted into the system, and in what proportion pumped-storage and gas turbines should be used. The model presently used by the Electricite de France is a rather ambitious simulation-by-the-month model. (See also W72-13567 -- 13568) (Settle-Wisconsin)
W72-13566

ECONOMICS OF PUMPED STORAGE IN NEW ENGLAND,
Alexander Kusko, Inc., Needham Heights, Mass.; and Massachusetts Ins. of Tech., Cambridge, Mass.
A. Kusko.
In: Pumped Storage Development and Its Environmental Effects, Proceedings of the International Conference, September 19-24, 1971, University of Wisconsin-Milwaukee, Milwaukee, p 414-417. 6 tab, 4 ref.

Descriptors: *Pumped storage, *Electric power production, *Energy, *Costs, Nuclear energy, Nuclear powerplants, Turbines, Optimization, *New England.
Identifiers: *Cost minimization.

Cost studies for pumped storage development in New England have shown a trend from first favoring pumped storage to recently favoring alternate forms of generation as more economical. An article in 1969 by S. R. Knapp suggested that the combination of nuclear base-load capacity with pumped storage would provide energy at a lower cost than either a nuclear-gas turbine combination or a nuclear-steam peaking combination. He estimated that the pumped storage combination would be 4.4% cheaper than the gas turbine combination by 1973 and 14.8% cheaper by 1977. In September, 1970, a report by H. Zinder and Associates, Inc. indicated that an energy system consisting of 12% pumped storage offered practically no cost advantages over systems consisting of 9% and 3% pumped storage, respectively. In February, 1971, Kusko reported that a pumped storage system would be a higher cost energy source than a gas turbine system. Finally, in May, 1971, the Generation Task Force for the New England Planning Committee concluded that pumped storage development in New England was not economical for either fossil-plant base load expansion or a mixture of fossil and nuclear-plant base load expansion. (See also W72-13566) (Settle-Wisconsin)
W72-13567

ECONOMIC ANALYSIS OF SWISS PUMPED STORAGE SCHEMES FOR VARIOUS PARAMETERS OF OPERATION AND ENERGY COSTS,
Maggia, Locarno (Switzerland).
H. Fankhauser, and G. Trucco.
In: Pumped Storage Development and Its Environmental Effects, Proceedings of the International Conference, September 19-24, University of Wisconsin-Milwaukee, Milwaukee, p 367-371. 7 fig, 2 tab.

Descriptors: *Pumped storage, *Electric power production, *Costs, Energy, Operations, Mathematical models.
Identifiers: *Swiss Alps, *Valuation model.

In order to analyze a pumped storage scheme designed for the Swiss Alps, two valuation models were developed. The models represent a nuclear and a thermic plant with an installed capacity of 300 MW. The application of these models allows (1) the determination of production capacity under the fixed operating conditions defined by the model, (2) the determination of average season production costs of pumped storage production, and (3) the estimation of those economic factors necessary for the comparison of different pumped storage projects. The factors include the utility value of energy, construction costs, yearly cost rates, and the costs of pumping energy. The influence of reservoir capacity on (1) the freedom of operation and (2) the reserve capacity of pumped storage in the power network is also considered. The effects of a weekly pumping cycle, a weekend pumping cycle, and long-time storage on reservoir capacity is assessed. (See also W72-13566) (Settle-Wisconsin)
W72-13568

DYNAMICS OF ION TRANSPORT DURING MOISTURE FLOW FROM A DOUGLAS-FIR FOREST FLOOR,
Washington Univ., Seattle.
J. G. McColl.
Soil Science Society of America Proceedings, Vol 36, No 4, p 668-674, July-August 1972. 4 fig, 3 tab, 32 ref. NSF Grant GB-8125.

Descriptors: *Ion transport, *Leaching, *Forest soils, *Lysimeters, Monitoring, Forests, Forest management, Douglas fir trees, Temperature, Soil water movement, Clear-cutting.
Identifiers: *Automated field-monitoring system.

Ion transport was studied during periods of moisture flow from the forest floor using automated equipment in a second-growth Douglas-fir forest in western Washington. The transport process was related to the temperature in the forest floor, the duration of time before flow, and the amount of moisture flow. The relationship of seasonal climatic changes to the ion transport process, and the changes in solution concentration during wetting cycles are described. The study provides a base for predicting possible effects of manipulating natural forest ecosystems. A warning is given of possible effects of some common forest-management practices. (Knapp-USGS))
W72-13570

A HYDROGEOLOGICAL ZONING OF THE AFRICAN CONTINENT (GIDROGEOLOGICHESKOYE RAYONIROVANIYE AFRIKANSKOGO MATERIKA),
For primary bibliographic entry see Field 02F.
W72-13592

INSTRUMENTATION FOR ENGINEERING MANAGEMENT OF A MULTI-PURPOSE RIVER BASIN SYSTEM (THE TRINITY RIVER BASIN, TEXAS),
Texas Univ., Austin. Center for Research in Water Resources.
E. F. Gloyna, A. J. D'Arezzo, and D. T. O'Laoghaire.
Available from the National Technical Information Service as PB-211 964, $3.00 in paper copy, $0.95 in microfiche. Center for Research in Water Resources, Technical Report CRWR-79, January 1972. 78 p, 78 ref. OWRR B-079-TEX (1).

Descriptors: *River basin development, Water resources development, *Data collection, *Monitoring, *Instrumentation, *Texas, Computer programs, Remote sensing, *Management.
Identifiers: *Trinity River, *Dallas-Fort Worth area, Industrial growth, River basin management, Algorithm, Fortran IV.

The conceptual requirements of future data acquisition and monitoring instrumentation systems for the efficient operation and management of a highly developed river basin system, such as envisaged for the Trinity River Canalization project were investigated. A practical inventory analysis was made of the entire river system, considering all major features, facilities and points of stress. The complexity of the entire system was evaluated and the feasibility of using a real-time data acquisition system of the Trinity River and its tributaries based on a closed-loop, feedback management systems approach was considered. A more detailed practical inventory analysis was made of the Dallas-Fort Worth area, a large urbanized region. Stationary continuous monitoring, mobile continuous monitoring and a regular grab sampling program were proposed. The problem of managing the waters of a river basin that are under increasing environmental stress because of rapid in-basin industrial growth was discussed. An algorithm, coded into Fortran IV, was suggested as a preliminary input to solving this problem that combines combinatorial analysis with a network plan routine. (Galwardi-Texas)
W72-13609

4B. Groundwater Management

GEOLOGY, HYDROLOGY, AND WATER QUALITY OF THE TRACY-DOS PALOS AREA, SAN JOAQUIN VALLEY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 02F.
W72-13051

IMPACT OF THE DECLINING WATER SUPPLY ON THE ECONOMY OF CURRY AND ROOSEVELT COUNTIES,
New Mexico State Univ., University Park. Dept. of Agricultural Economics and Agricultural Business.
F. H. Osterhoudt.

New Mexico Agricultural Experiment Station Research Report No 222, January, 1972. 80 p, 6 fig, 30 tab, 52 ref, 1 append.

Descriptors: *Irrigation, *Groundwater, *Groundwater recharge, Water table, Economic impact, Forecasting, New Mexico.
Identifiers: Curry County (New Mexico), Roosevelt County (New Mexico).

Curry and Roosevelt, adjacent counties in eastern New Mexico, are rapidly depleting their irrigation water supply. Since there are no regularly flowing streams in either county, the irrigation water is supplied by wells drilled in permeable, water-bearing sands and gravel. Unfortunately, these groundwater sources have little or no recharge. In order to analyze the impact of this declining water supply on the economics of the two counties, a linear programming simulation model is developed. The model is used (1) to compare, under four alternative land-use assumptions, the regional and county situations for the 1967-1969 base period with those projected for the year when irrigation ceases completely, (2) to trace the economic effects of the decline of irrigation water by 10-year intervals over the period from the base year to 2020, and (3) to develop projections in which all government programs are removed from the calculations. The model suggests that by 2020 little or no irrigation will remain. Irrigated agriculture will be replaced by less intensive agricultural uses. Farm employment and farm purchases will decline, smaller amounts of agricultural products will be handled, and land tax income to local governments will diminish. Numerous tables are included. (Settle-Wisconsin)
W72-13078

THE ECONOMICS OF GEOTHERMAL POWER,
For primary bibliographic entry see Field 06C.
W72-13092

GEOPHYSICS AND GROUND WATER, PART 2, APPLIED USE OF GEOPHYSICS.
For primary bibliographic entry see Field 08A.
W72-13146

WATER SYSTEM AND TREATMENT HANDBOOK.
For primary bibliographic entry see Field 08B.
W72-13147

THE AUTHORITATIVE PRIMER - GROUND WATER POLLUTION.
For primary bibliographic entry see Field 05B.
W72-13152

WATER SUPPLY, TREATMENT AND DISTRIBUTION, MID-HUMBOLDT COUNTY URBAN PLANNING PROGRAM.
Baruth and Yoder, Walnut Creek, Calif.
For primary bibliographic entry see Field 06D.
W72-13161

FACTORS PERTINENT TO WATER QUALITY IN THE ALBUQUERQUE METROPOLITAN AREA,
Albuquerque Urban Observatory, N. Mex.
For primary bibliographic entry see Field 06D.
W72-13168

ELECTROMAGNETIC METHODS FOR MAPPING AND EVALUATING AQUIFERS,
California Univ., Berkeley. Water Resources Center.
For primary bibliographic entry see Field 02F.
W72-13182

A NEW TECHNIQUE FOR TIME-VARIANT GROUND WATER FLOW ANALYSIS,
For primary bibliographic entry see Field 02F.
W72-13263

DEVELOPMENT OF GROUND WATER IN THE HOUSTON DISTRICT, TEXAS, 1966-69,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 03D.
W72-13264

ON THE HYDROGEOLOGY OF THE COASTAL REGION OF SOUTHEASTERN FINLAND,
Geological Survey of Finland, Otaniemi.
P. Lahermo.
Geological Survey of Finland Bulletin 252, 1971. 44 p, 31 fig, 2 tab, 48 ref.

Descriptors: *Hydrogeology, *Groundwater, *Groundwater basins, *Groundwater barriers, *Groundwater movement, Infiltration, Percolation, Fracture permeability, Structural geology, Geologic formations, Bedrock, Inorganic compounds, Metals, Water types, Water properties, Water quality, Water pollution, Water yield, Wells, Pumping.
Identifiers: *Finland, *Eskers, *Rapakivi.

With respect to structure and origin, the Quaternary deposits in southeastern Finland are similar to those elsewhere along the Finnish coast. Glaciofluvial groundwater sources include eskers, separated from each other by clay beds, and smaller groundwater basins, separated from each other by rocky thresholds. The amount of groundwater obtainable from any point in an esker is generally between 200 and 500 cu m/day and only in rare instances does it exceed 1,000 cu m/day. Wells drilled into nearly cubically fractured rapakivi granite yield an average of 50 cu m of groundwater a day. The amounts of water drawn from bedrock consisting of rapakivi clearly exceed the yield of other species of bedrock in Finland. Deepening of a drilled well frequently increases the amount of groundwater, although there is no significant correlation between depth and yield. The content of iron-rich, humus-bearing groundwater in eskers at the beginning of pumping is high but diminishes as the groundwater table drops. Chloride concentrations in groundwater drawn from borings close to the coast and from exceptionally deep borings far from the coast are high but decrease during constant use. The amount of dissolved matter in groundwater is inversely proportional to the rate of percolation, which, in turn, depends on the structure of the geological formation. During the weathering process, sodium is released more readily than potassium, and alkaline earths are released in relatively larger amounts than alkalis. The fluoride content of groundwater of the rapakivi granite area is 10 times higher than that of groundwater of the country as a whole. The pollution caused by agricultural activity is reflected in groundwater through an increase in its nitrogen compounds, chlorides, sodium, and potassium. (Josefson-USGS)
W72-13265

GROUND WATER IN SANTA BARBARA AND SOUTHERN SAN LUIS OBISPO COUNTIES CALIFORNIA, SPRING 1969 TO SPRING 1970,
Geological Survey, Menlo Park, Calif.
J. W. Warner.
Geological Survey Open-file Report, May 8, 1972. 27 p, 10 fig, 3 tab, 4 ref.

Descriptors: *Groundwater resources, *Withdrawal, *Aquifer characteristics, *Water quality, *California, Hydrologic data, Data collections, Pumping, Water yield, Water utilization, Water demand, Chemical analysis, Water level fluctuations, Groundwater recharge.
Identifiers: *Santa Barbara County (Calif), *San Luis Obispo County (Calif).

In Santa Barbara and southern San Luis Obispo Counties, California, precipitation for the 1970 water year (Oct. 1, 1969 to Sept. 30, 1970) was considerably lower than the long-term average. Precipitation at Santa Barbara was 11.83 inches, 66% of the 103-year average; precipitation at Santa Maria was 8.26 inches, 60% of the 85-year average. Groundwater pumpage increased slightly from that of 1968 in most areas. Pumpage decreased slightly in areas of the Santa Ynez unit except for the upland area of the Lompoc subunit and the Santa Ynez subunit. The greatest increase in pumpage occurred in the Cuyama Valley subunit, where 55,300 acre-feet was pumped in 1968 compared to 76,900 acre-feet for 1969--an increase of 21,600 acre-feet. Water levels remained about the same between spring 1969 and spring 1970. Groundwater in storage decreased in areas of the Santa Ynez unit and increased in all other major groundwater basins. The largest groundwater storage increase, about 133,000 acre-feet, occurred in the Santa Maria and Sisquoc subunits. There was no significant change in groundwater quality from the previous year. (Woodard-USGS)
W72-13266

MAJOR AQUIFERS IN CHARLES MIX AND DOUGLAS COUNTIES, SOUTH DAKOTA,
Geological Survey, Vermillion, S. Dak.
For primary bibliographic entry see Field 02F.
W72-13272

DATA FROM CONTROLLED DRILLING PROGRAM IN DU PAGE, KANE, AND KENDALL COUNTIES, ILLINOIS.
Illinois State Geological Survey, Urbana.

Illinois State Geological Survey Environmental Geology Notes, No 53, P. C. Reed, compiler, July 1972. 42 p, 1 fig, 1 tab.

Descriptors: *Groundwater resources, *Drill holes, *Test wells, *Well data, *Illinois, Drilling, Geology, Logging (Recording), Data collections, Sieve analysis, Soil properties, Aquifer characteristics, Pumping, Hydrogeology.
Identifiers: *DuPage County (Ill), *Kane County (Ill), *Kendall County (Ill).

To facilitate the search for new shallow sources of groundwater for the rapidly expanding metropolitan areas of northeastern and north-central Illinois, the Illinois State Geological Survey and the State Water Survey made drill hole tests in three counties. Fourteen holes were drilled at 8 sites in Du Page County, 3 sites in Kane County, and 2 in Kendall County. Data from field and laboratory analyses of sample materials collected from the holes are presented. Only shallow groundwater sources--the glacial deposits and the underlying limestone bedrock--were evaluated, because they are believed to be capable of yielding more groundwater than they are yielding at present. The deep sources of water, the artesian sandstones, are already being overpumped in the Chicago region. Pumping tests were conducted at two sites, one in Du Page County and one in Kane County. (Woodard-USGS)
W72-13275

UNSTEADY RADIAL FLOW IN AN UNCONFINED AQUIFER,
Birmingham Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 02F.
W72-13466

TEST-OBSERVATION WELL NEAR ODESSA, WASHINGTON: DESCRIPTION AND PRELIMINARY RESULTS,
Geological Survey, Tacoma, Wash.
K. L. Walters, D. R. Cline, and J. E. Luzier.
Geological Survey Open-file Report, 1972. 25 p, 6 fig, 2 ref.

Descriptors: *Groundwater resources, *Test wells, *Observation wells, *Aquifer characteristics, *Washington, Water resources development, Pumping, Water yield, Drawdown, Groundwater movement, Hydrogeology, Well data, Water level fluctuations, Hydrologic data, Data collections.
Identifiers: *Odessa (Wash.).

A test-observation well drilled near Odessa, Wash., provides information on the area's aquifer characteristics which is not otherwise available from existing deep irrigation wells. The information is of value to the State of Washington Department of Ecology in its management decisions in this area where heavy groundwater withdrawals have resulted in increasing annual water-level declines. The 10-inch well is 750 ft deep and penetrates six aquifer zones (A through F) in basalt. The upper 60 ft of the well is cased, while the remainder of the hole is open in the basalt. The well was test pumped during drilling and showed specific capacities of 0.65 gallon per minute per foot of drawdown when at the 258-ft depth and open to aquifers A and B, 0.62 gpm/ft of drawdown when at the 540-ft depth and open to aquifers A through D, and 22 gpm/ft of drawdown when at the full 750-ft depth and open to all six aquifers. Borehole geophysical logging provided information on natural gamma radiation, water temperature and resistivity, downhole movement of the water, and borehole diameter. (Woodard-USGS)
W72-13571

4C. Effects on Water of Man's Non-Water Activities

SEDIMENTATION AND CONTAMINANT CRITERIA FOR WATERSHED PLANNING AND MANAGEMENT,
Colorado State Univ., Fort Collins. Environmental Resources Center.
H. W. Shen.
Available from the National Technical Information Service as PB-211 665, $3.00 in paper copy $0.95 in microfiche. Completion Report Series No 31, Colorado Environmental Resources Center, Fort Collins, June 1972, 175 p, 44 fig, 9 tab, 9 ref, 2 append. OWRR-B-014-COLO (6).

Descriptors: *Watershed management, *Forest management, *Sediment yield, Erosion control, Surface runoff, *Vegetation effects, *Planning, River basins, Clear cutting, *Model studies, Sediments, Agricultural watersheds.

A model to estimate the resistance of flow due to various combination of tall vegetation (such as trees) on the order of flow depths is given. An empirical curve by regression to estimate the flow resistance with large rigid roughness (short vegetation such as grasses) in the order of normal boundary roughness is developed. The possibility of applying this curve to flexible roughness has also been explored. An analytical method to investigate the effect of vibrating flexible roughness elements in flow rate is also presented. The relative effect of various combinations of tall vegetation on the reduction of sediment yields based on the reduction of flow rates is studied. This should be rather useful in determining the relative effect on sediment yields by clear cutting and other selective cutting of forest lumber. The effect of rainfall on these sheet flows is investigated and a simplified method to estimate the rainfall effect on flow resistance is also developed. The dispersion of contaminated bed particles for different time and space can be found from graphical solutions as illustrated. An empirical curve to estimate the sediment bed material load for various flow conditions is found.
W72-13353

4D. Watershed Protection

SEDIMENTATION AND CONTAMINANT CRITERIA FOR WATERSHED PLANNING AND MANAGEMENT,
Colorado State Univ., Fort Collins. Environmental Resources Center.
For primary bibliographic entry see Field 04C.
W72-13353

RESEARCH ON THE EFFECT OF SOIL AND WATER CONSERVATION BY STRAW MULCH ON THE SLOPE FIELDS, (IN KOREAN),
Institute of Agricultural Engineering Utilities, Suwon (Korea).
For primary bibliographic entry see Field 03F.
W72-13376

WIND EROSION IN UZBEKISTAN AND SOME METHODS FOR ITS PREVENTION,
For primary bibliographic entry see Field 02G.
W72-13378

TILLAGE OF SOIL FOR EROSION CONTROL AS A DROUGHT CONTROL MEASURE,
For primary bibliographic entry see Field 03F.
W72-13382

CONTROL OF SEDIMENT IN CANALS.

Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 98, No HY9, Paper 9177, p 1647-1689, September 1972. 20 fig, 1 tab, 37 ref.

Descriptors: *Sediment control, *Bed load, *Canals design, Hydraulic models, Model studies, Reviews, Diversion, Settling basins, Dredging, Scour, Sediment transport, Desilting.
Identifiers: *Sediment ejectors.

Removal of sediment from stream diversions into canals is a major design problem. The design must be based on the most economic arrangement to remove that part of the sediment which cannot be transported through the lateral system onto the land without damage. Design of diverstion structures by analytical methods is not yet practical. Such designs are most reliable when based on model studies. Canal diversions from a stream are usually located on the outside of a curve to take advantage of the principle of spiral flow. Structures that reduce the amount of bedload entering canals are classified generally as diverters or ejectors. Several examples of these structures are described and reviewed. Removal of accumulated sediment from most of these structures is accomplished by sluicing. Excessive amount of suspended sediment is removed from canals by settling basins. Sediment deposited in settling basins is removed by sluicing, dredging, or mechanical means. Content is draft for a section in Chapter V of the proposed ASCE Manual on Sedimentation Engineering. (Knapp-USGS)
W72-13576

05. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification of Pollutants

DEGRADATION OF UREA IN CONCENTRATED AQUEOUS SOLUTION,
Connecticut Unit., Storrs. School of Pharmacy.
For primary bibliographic entry see Field 05B.
W72-13048

AN INTEGRATED STUDY OF EARTH RESOURCES IN THE STATE OF CALIFORNIA USING REMOTE SENSING TECHNIQUES,
California Univ., Berkeley; California Univ., Irvine; California Univ., Davis; California Univ., Los Angeles; California Univ., Riverside; and California Univ., Santa Barbara.
For primary bibliographic entry see Field 07B.
W72-13052

AN ANNOTATED BIBLIOGRAPHY OF REMOTE SENSING OF AIR AND WATER POLLUTION,
Iowa Univ., Iowa City.
P. D. Brooks, and G. W. Thomson.
Available from NTIS, Springfield, Va 22151 as AD-737 588, Price: $3.00 paper copy; $0.95 microfiche. Army Corps of Engineers Topographic Command TOPOCOM Special Bibliography, September 1971. 21 p, 66 ref.

Descriptors: *Bibliographies, *Publications, *Remote sensing, *Water pollution sources, *Air pollution, Reviews, Documentation, Technical writing.
Identifiers: Annotated bibliography.

This annotated bibliography contains a list of literature published between 1965-70 on the subject of remote sensing of air and water pollution. The periodicals examined for articles include Applied Science and Technology, Reader's Guide to Periodical Literature, Air Pollution Control Association Abstracts, Journal of the Air Pollution Control Association, Journal of the Water Pollution Control Federation, Atmospheric Environment, Photogrammetric Engineering, Photogrammetria, Papers from the 1969 and 1970 Annual Meetings of the American Society of Photogrammetry, Journal of Applied Meteorology, Journal of Atmospheric and Terrestrial Physics, Bulletin of the American Meteorological Society, Symposiums of Remote Sensing of the Environment, and the International Journal of Air and Water Pollution. Articles from periodicals such as Science, Nature, Electronics Technology, Power, Review of Scientific Instruments, etc. were either listed in Applied Science and Technology or Reader's Guide to Periodical Literature or were listed as references in articles obtained previously. No attempt was made to completely search these periodicals for articles. (Woodard-USGS)
W72-13055

IRON AND MANGANESE PROFILES IN A COASTAL POND WITH AN ANOXIC ZONE,
Woods Hole Oceanographic Institution, Mass.
R. A. Horne, and C. H. Woernle.
Chemical Geology, Vol 9, No 4, p 299-304, June 1972. 3 fig, 1 tab, 9 ref.

Descriptors: *Water chemistry, *Ponds, *Anaerobic conditions, *Iron, *Manganese, Hydrogen sulfide, Oxidation-reduction potential, Stratification, Mixing.

The concentration of iron and manganese in the waters of a coastal pond with an anoxic zone (Oyster Pond, Falmouth, Mass.) were determined as a function of depth by atomic absorption spectrophotometry. The iron and manganese profiles exhibit marked maxima at a depth corresponding to the surface of the anoxic bottom layer. In mid-August the pond was apparently mixed and the maxima were disrupted. (Knapp-USGS)
W72-13057

ORGANIC MATTER IN RED SEA SEDIMENTS,
Commonwealth Scientific and Industrial Research Organization, North Ryde (Australia). Div. of Mineralogy.
For primary bibliographic entry see Field 02J.
W72-13058

PESTICIDE RESIDUE ANALYSIS IN THE PRESENCE OF POLYCHLOROBIPHENYLS (PCB'S),
Ontario Research Foundation, Toronto.
L. M. Reynolds.
Pesticide Reviews, Vol 34, p 27-57, 1971. 7 fig, 2 tab, 62 ref.

Descriptors: *Aroclors, *Polychlorinated biphenyls, *Pollutant identification, *Analytical techniques, *Gas chromatography, *Chemical analysis, *Path of pollutants, Organic compounds, Chlorinated hydrocarbon pesticides, DDT, Chemistry, Analysis, Chromatography, Organophosphorous pesticides, Adsorption, Toxicity, Water pollution sources, Water pollution effects, Water pollution, Ecology, Canada.
Identifiers: *Florisil, Electron capture, Sublethal effects, Residues, Pollutant residues, Polychlorinated biphenyl residues.

Since 1966, polychlorinated biphenyls (PCB's) have been detected in fish and wildlife. Due to their similarities in structure and properties to the organochlorine pesticides, the PCB's tend to interfere with accurate gas-liquid chromatography - electron capture determination of organochlorine and many organophosphorous pesticides. A method for recognizing the presence of PCB's in samples, separating them from pesticides, and accurately determining the pesticide levels is described. A simultaneous estimate of total PCB content is afforded. Further research on toxicity and sublethal effects of PCB mixtures and their individual components is required. If particular components are more toxic than others, refinement of the PCB quantitative methods will be necessary. Also discussed are uses and properties of PCB's, ecosystem kinetics and toxicity of PCB's, and residues of PCB's found in Canadian wildlife. (LeGore-Washington)
W72-13097

FIELD TESTING FOR WATER QUALITY CONTROL AT KRAFT PULP MILLS,
British Columbia Research Council Vancouver.
For primary bibliographic entry see Field 05C.
W72-13102

IDENTIFICATION AND ESTIMATION OF THE MAJOR COMPONENTS OF A COMMERCIAL POLYCHLORINATED BIPHENYL MIXTURE, AROCLOR 1221,
Bedford Inst., Dartmouth (Nova Scotia). Marine Ecology Lab.
D. E. Willis, and R. F. Addison.
Journal of the Fisheries Research Board of Canada, Vol 29, No 5, p 592-595, 1972. 1 fig, 2 tab, 13 ref.

Descriptors: *Polychlorinated biphenyls, *Aroclors, *Analysis, *Pollutant identification, Chemical analysis, Chlorinated hydrocarbon pesticides, Organic compounds.
Identifiers: *Composition, Component analysis, Biphenyl, Dichlorobiphenyl.

The major components of Aroclor 1221, a polychlorinated biphenyl mixture, have been tentatively identified as the following (weight % composition of each component is given in parentheses): biphenyl (12.7), 2-chlorobiphenyl (28.4), 4-chlorobiphenyl (18.7), 2,2'-dichlorobiphenyl (9.2), 2,4-dichlorobiphenyl (3.5), 2,4'-dichlorobiphenyl (13.6), and 4,4'-dichlorobiphenyl (6.2). (LeGore-Washington)
W72-13104

EFFLUENT CHARACTERISTICS OF BLEACHED KRAFT PULP MILLS,
British Columbia Research Council Vancouver. Div. of Applied Biology.
For primary bibliographic entry see Field 05C.
W72-13108

SAMPLING OF FISH MUSCLE FOR M.S. 222 AND QUINALDINE RESIDUES,
Bureau of Sport Fisheries and Wildlife Warm Springs, Ga. Southeastern Fish Control Lab.
C. W. Luhning, and P. D. Harman.
Journal of the Fisheries Research Board of Canada, Vol 28, No 1, p 113-115, 1971. 1 fig, 1 tab, 4 ref.

Descriptors: Public health, Absorption, Analytical techniques, Methodology, Pollutant identification, Water pollution effects, *Sulfonates.
Identifiers: *MS-222, *Tricaine methanesulfonate, *Quinaldine, *2-methylquinoline, *Fish fillets, Pollutant residues, Seafood, *Anesthetics.

Large variations in concentrations of M.S. 222 (tricaine methanesulfonate) and quinaldine (2-methylquinoline) residues occurred in various areas of fish fillets. Residue analysis of replicate samples from homogenized fillets yielded more representative results than samples cut from various areas of fillets. (LeGore-Washington)
W72-13111

RESIDUES OF ORGANOCHLORINE PESTICIDES AND POLYCHLORINATED BIPHENYLS IN SOME COMMERCIALLY PRODUCED CANADIAN MARINE OILS,
Bedford Inst., Dartmouth (Nova Scotia). Marine Ecology Lab.
For primary bibliographic entry see Field 05B.
W72-13114

ATTACHED ALGAE ON ARTIFICIAL AND NATURAL SUBSTRATES IN LAKE WINNIPEG, MANITOBA,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
D. Evans, and J. G. Stockner.
Journal of Fisheries Research Board of Canada, Vol 29, No 1, p 31-44, January 1972. 7 fig, 4 tab, 21 ref.

Descriptors: *Biomass, *Aquatic algae, *Aquatic productivity, Light, Turbidity, Nutrients, Heterogeneity, Chlorophyta, Chrysophyta, Bioindicators, Physicochemical properties, Microscopy, Limnology, Water quality, Ecology, Aquatic habitats, Cladophora, Limiting factors, Ecological distribution.
Identifiers: *Lake Winnipeg, *Substrates, Achnanthes minutissima, Achnanthes cf. birgiani, Amphipleura pellucida, Amphora ovalis, Amphora ovalis v. pediculus, Cocconeis pediculus, Cocconeis placentula, Cyclotella cf. socialis, Cyclotella stelligera, Cymbella spp, Diatoma ssp.

The composition and distribution of attached algae on artificial (navigational buoys) and natural substrates in Lake Winnipeg in 1969-70, was studied, in the fall after about 145 days' growth, with special emphasis on the diatoms, the major component of the attached algal flora. Attached algae from known areas of the surface of representative substrates were weighed (dry-weight) and counted. Total diatom volumes (cu mm/sq cm) were calculated using an equation for the geometrical shape that closely resembled individual species, and by applying suitable corrections to each calculation. The percent by volume of other algal groups was estimated by microscopy. On both natural and artificial substrates a distinct zonation pattern related to water transparency or available light was prevalent. Preliminary results indicated that light was the most important physical factor affecting growth and specific composition of attached algae on substrates. Biomass values (dry weight) ranged from 1.7 to 29.1 mg/sq cm, with the greatest values consistently occurring between a 10 and 25 cm depth on buoys in the south basin. Diatom density and diatom volume were estimated from buoy samples and varied respectively, within the range 200,000-6,650,000 diatoms/sq cm and 0.32-10.00 cu mm/sq cm. It appears that nutrients may limit growth of attached algae in the north basin, whereas in the south basin, light is the major limiting factor. The specific composition of the algal assemblages on particular buoys was more related to the physical-chemical features of a major river plume in close proximity to the buoy than to a homogeneous Lake Winnipeg water mass. This factor, together with greater turbidity in the shallower south basin, is largely responsible for the observed heterogeneity among the attached algal assemblages in Lake Winnipeg. (Byrd-Battelle)
W72-13142

DIATOMS OF THE AUVERNIER NEOLITHIC STATION (LAKE NEUCHATEL), (LES DIATOMEES DE LA STATION NEOLITHIQUE D' AUVERNIER (LAC DE NEUCHATEL)),
Neuchatel Univ. (Switzerland). Institut de Zoologie.
For primary bibliographic entry see Field 02H.
W72-13143

A REVIEW OF AUTECOLOGICAL AND SAPROBIOLOGICAL DATA ON FRESHWATER CILIATES, (EINE ZUSAMMENSTELLUNG VON AUTOKOLOGISCHEN UND SAPROBIOLOGISCHEN BEFUNDEN AN SUSSWASSERCILIATEN),
Bonn Univ. (West Germany). Zoological Inst.
For primary bibliographic entry see Field 05C.
W72-13144

BACTERIA CAUSE MANY PROBLEMS.
For primary bibliographic entry see Field 05F.
W72-13156

A STATISTICAL ANALYSIS OF THE MERCURY CONTENT OF FRESH WATER FISH IN NEW YORK STATE,
New York State Dept. of Environmental Conservation, Albany. Environmental Quality Research and Development Unit.
For primary bibliographic entry see Field 05C.
W72-13163

A SMALL BIOASSAY LABORATORY DESIGNED FOR EXPERIMENTAL THERMAL EFFECTS EVALUATION,
Washington Univ., Seattle. Coll. of Fisheries.
Q. J. Stober.
University of Washington, College of Fisheries, Fisheries Research Institute, Circular No 72-1, 1972. 12 p, 4 fig.

Descriptors: *Bioassay, *On-site laboratories, *Evaluation, *Thermal pollution, *Laboratories, *Research facilities, Thermal powerplants, Water pollution sources, Water pollution effects, Heated water, Temperature control, Saline water systems, Laboratory equipment.
Identifiers: Thermal effects, Puget Sound (Wash).

Design details with drawings are presented for a small bioassay laboratory useful for specific site evaluation of large industrial developments. This laboratory has been operated at a proposed 1000 Mw nuclear power site in Northern Puget Sound (Kiket Island), Washington, since April, 1970. The laboratory is described, as well as the individual systems, including salt-water supply, heating, temperature control, compressed air supply, and emergency power supply. Experimental equipment and laboratory maintenance are discussed. The laboratory building houses insulated wet and dry laboratories, a mechanical equipment room, and a boat storage experimental area. (Svensson-Washington)
W72-13177

A RELIABLE ROUTINE TEST FOR ESCHERICHIA COLI FAECALIS FROM

WATER BY THE DETERMINATION OF GLUTAMIC ACID DECARBOXYLASE ACTIVITY THROUGH WEDGE STRIP CHROMATOGRAPHY,
Leipzig Univ. (East Germany). Hygiene-Institut.
G. Vogler.
Z Gesamte Hyg Grenzgeb. Vol 17, No 8, p 585-588. 1971. Illus.
Identifiers: *Water analysis, *E coli, Analytical techniques, Chromatography, Decarboxylase, Glutamic acid, *Pollutant identification.

Various bacteriological techniques for identifying and quantitating intestinal E. coli organisms in water, based on the IMVC test (Indole-Methyl red-Voges-Proskauer-Citrate) are reviewed but characterized as insufficiently selective. The advantages of the glutamic acid decarboxylase activity (GDA) test is that it is selective, saves working time and materials and gives the desired information 2 days sooner than older methods. Only fecal E. coli contain the enzyme that decarboxylate glutamic acid to gamma-aminobutyric acid; the latter is identified and estimated chromatographically.--Copyright 1972, Biological Abstracts, Inc.
W72-13211

NONIONIC DETERGENT DEGRADATION: III. INITIAL MECHANISM OF THE DEGRADATION,
Laboratory of the Government Chemist, London (England).
For primary bibliographic entry see Field 05B.
W72-13246

RAPID ASSESSMENT OF WATER QUALITY BY FLUORESCENT ANTIBODY IDENTIFICATION OF FECAL STREPTOCOCCI,
Massachusetts Univ., Amherst.
M. T. Pavlova, E. Beauvais, F. T. Brezenski, and W. Litsky.
Preprint, presented at 6th International Water Pollution Research Conference, Session 3, Hall A, Paper No 5, June 20, 1972. 8 p, 6 fig, 3 tab, 5 ref.

Descriptors: *Pollutant identification, Water quality, *Sewage, *Analytical techniques, *Streptococci, Fluorescence, Laboratory tests, Test procedure, Monitoring.
Identifiers: *Fecal streptococcus, *Fluorescent antibody reaction, Staining method.

Laboratory studies indicated that all species of group D streptococci (fecal streptococci) yielded positive fluorescent antibody reactions with laboratory prepared labeled antibodies. The specificity of these reactions was also demonstrated in that no cross-reactions with non-group D streptococci occurred after trypsimization of the smears prior to staining. Materials and test methods utilized were outlined. Fecal streptococci densities varied between 2.7 x 10 (1) to 1.4 x 10 (3) per 100 ml sample from the Connecticut and Mill rivers respectively, while in sewage these organisms were in the order of 2.4 x 10 (6). The fecal streptococci distribution from 15 river samples and 7 sewage samples were presented in tabular form. Using the outlined procedure, fecal streptococci can be indicated from water samples within 20 hours whereas if the routine biochemical and precipitation tests were employed, the identification procedure may take as long as 7-14 days. The ease with which the fluorescent antibody method can be employed for the rapid enumeration and identification of fecal streptococci from water and sewage suggested that the procedure may be automated for use in a continual monitoring system. (Galwardi-Texas)
W72-13248

A NEW APPROACH IN E. COLI IDENTIFICATION,
Technion - Israel Inst. of Tech., Haifa. Environmental Engineering Labs.
N. Buras, and Y. Kott.
Preprint, presented at 6th International Water Pollution Research Conference, Session 3, Paper No. 6, Hall A, June 20, 1972. 9 p, 1 fig, 2 tab, 17 ref.

Descriptors: *E. coli, *Analytical techniques, *Pollutant identification, *Bacteriophage, Coliforms, Laboratory tests, Efficiencies, Performance, Temperature.

A comparative study of conventional methods with a method using E. coliphages as E. coli identifiers was conducted. In order to ascertain the reliability of the test, 257 water samples from various sources with various degrees of pollution were tested. However, only 58 samples contained E. coli bacteria. Experimental procedures and analytical techniques utilized were outlined. The results showed that 93.5% of the E. coli present in the water samples were identified by the specific E. colibacteriophages available. Results were arranged in tabular form. It was suggested that this method be used in parallel with conventional methods so that sufficient data will be accumulated to confirm the accuracy of the test and its reliability. (Galwardi-Texas)
W72-13249

HIGH LEAD CONCENTRATIONS IN COLUMBUS SNOW,
Ohio State Univ. Research Foundation, Columbus. Inst. of Polar Studies.
W. L. Hamilton, and J. E. Miller.
Ohio J Sci. Vol 71, No 5, p 313-316. 1971. Map.
Identifiers: Automobiles, *Columbus (Ohio), Potable water, *Lead, Snow, *Spectrophotometry, Water pollution sources, Pollutant identification.

Pb concentrations in snow collected on the ground within 100 feet of streets and roads in Jan., 1970, were determined by atomic absorption spectrophotometric analysis of dissolved and particulate fractions of impurities. Twenty-seven samples of snow were collected over a 20 square-mile, suburban, mainly residential part of Columbus, Ohio. Measured concentrations were between 0.05 and 1.09 ppm Pb, with an average of 0.41 ppm. In all but one sample the lead concentration exceeded the U.S. Public Health Service safe limit for drinking water of 0.05 ppm. The temporal and areal distributions of concentrations, together with a comparison with Fe concentrations measured in the same samples, indicated that autom obile exhaust was the probable source of the Pb.--Copyright 1972, Biological Abstracts, Inc.
W72-13296

VARIATION IN DIATOM MORPHOLOGY AND WATER POLLUTION,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 05C.
W72-13297

A PILOT PROGRAM TO DETERMINE THE EFFECT OF SELECTED NUTRIENTS (DISSOLVED ORGANICS, PHOSPHORUS, AND NITROGEN) ON NUISANCE ALGAL GROWTH IN AMERICAN FALLS RESERVOIR,
Idaho Univ., Moscow. Water Resources Research Inst.
For primary bibliographic entry see Field 05C.
W72-13300

PLANT PHYSIOLOGY: ON THE DEUTERIUM CONTENT OF ORANGE JUICES,
Institut de Recherches Appliquees du Beissons, Montreuil (France).
For primary bibliographic entry see Field 02K.
W72-13334

A NEW MODEL OF THE KAJAK BOTTOM SAMPLER, AND OOTHER IMPROVEMENTS IN THE ZOOBENTHOS SAMPLING TECHNIQUE,
Helsinki Univ., Lammi (Finland). Lammi Biological Station.
For primary bibliographic entry see Field 07B.
W72-13338

TOTAL BACTERIAL NUMBER IN RYBINSK RESERVOIR,
Akademiya Nauk SSSR, Moscow. Institut Biologii Vnutrennykh Vod.
V. I. Romanenko.
Mikrobiologiya. Vol 40, No 4, p 707-713. 1971. Illus. Maps. English summary.
Identifiers: Abundance, *Bacteria, Number, *Rybinsk reservoir, Seasonal, USSR, Reservoirs.

The total bacterial number was calculated by a direct count on membrane filters during 16 yr (1954-1969) from May to Nov. with intervals of 15 days on 6 stations of the Rybinsk reservoir. The average bacterial number during all years was 1.43 plus or minus 0.18 x 1,000,000/ml of water. Distribution in water layers was uniform. Two statistically reliable maxima (in the spring and in the autumn) and 2 minima (in the summer and in the winter) were registered. The spring aand autumn maxima were induced by abiotic factors: freshets, floods and mixing with wind. The bacterial number was most stable in summer which is also during their most intensive growth.--Copyright 1972, Biological Abstracts, Inc.
W72-13342

ON THE CONTENT OF COBALT IN WATER MEDIUM (K OBSAHU KOBALTU VE VODNIM PROSTREDI),
Vyzkumny Ustav Rybarsky a Hydrobiologicky Vodnany, Prague (Czechoslovakia).
For primary bibliographic entry see Field 05B.
W72-13345

CONTAMINATION OF MARINE LITTORAL AND SEA FOODS BY PESTICIDES, (CONTAMINATION DU LITTORAL MARITIME ET DES FRUITS DE MER PAR LES PESTICIDES),
Poitiers Univ. (France). Faculte de Medicine et de Pharmacie.
For primary bibliographic entry see Field 05C.
W72-13347

OFFENSIVE-ODOR SUBSTANCE IN THE EVIL--SMELLING FISH FROM THE SEA-POLLUTED BY PETROLEUM AND PETROCHEMICAL INDUSTRIAL WASTE: I. IDENTIFICATION OF OFFENSIVE-ODOR SUBSTANCE,
Okayama Univ. (Japan). Dept. of Public Hygiene.
Masana Ogata, and Yoshio Miyake.
Acta Med Okayama. Vol 24, No 4, p 471-481. 1970. Illus.
Identifiers: *Odor, Fish, Waste treatment, Water pollution sources, Identification, Industrial wastes, *Toluene, Water pollution effects, Oil, Oil wastes, Chemical wastes.

To reveal the source of offensive odor of fish from the sea facing petroleum and petrochemical industries, analyses were made on sea water, industrial wastes, offensive odor fish meat and eels kept in the sea or industrial waste for a certain period, by means of gas chromatography, IR, and UV absorption spectrophotometries and mass-spectrometry. Observations revealed toluene as possibly responsible for the bad smell of the fish. Finally, by analyzing the meat extract of the fish kept in the sea water containing toluene and by identifying the same smell as that of the offensive odor fish from the off-shore of the industries, it was confirmed that toluene imparts the offensive odor to fish. The activated sludge process effectively removed toluene from the industrial wastes.

The aliphatic carbohydrate as the possible source of the offensive odor of fish is discussed.--Copyright 1972, Biological Abstracts, Inc.
W72-13379

A RAPID METHOD EMPLOYING IMPREGNATED CHARCOAL AND ATOMIC ABSORPTION SPECTROPHOTOMETRY FOR THE DETERMINATION OF MERCURY,
National Inst. for Occupational Safety and Health, Cincinnati, Ohio.
A. E. Moffitt, and R. E. Kupel, Jr.
Am Ind Hyg Assoc J. Vol 32, No 9, p 614-620. 1971. Illus.
Identifiers: *Analytical techniques, *Mercury, *Atomic adsorption, Spectrophotometry, Pollutant identification.

A quantitative procedure was developed for the determination of submicrogram quantities of Hg in atmospheric, biological, and aquatic samples. In the analysis of biological and water samples, organically bound Hg is oxidized with nitric acid, and all Hg present is reduced to the elemental state with stannous chloride. The liberated Hg is driven by an air current through impregnated charcoal for approximately 2 min. A glass tube packed with impregnated charcoal is used to take integrated atmospheric samples. All charcoal samples are analyzed directly for Hg with an atomic absorption sampling boat assembly. Measurement of the recorder peak height is used to determine the quantity of Hg present. The total analysis time is less than 5 min for aqueous samples, and the minimum detectable quantity of mercury is 0.02 microgram. After collection of Hg, the charcoal samples may be stored for later analysis.--Copyright 1972, Biological Abstracts, Inc.
W72-13389

THE DETERMINATION OF FLUORINE IN PLANTS WITH THE FLUORIDE ION SELECTIVE MEMBRANE ELECTRODE,
Ghent Rijksuniversiteit (Belgium). Dept. of Agricultural Science.
M. Verloo, and A. Cottenie.
Meded Fac Landbouwwet Rijksuniv Gent. Vol 35, No 1, p 291-299. 1970. Illus. English summary.
Identifiers: Electrodes, Fluorides, *Fluorine, Grasses M, Membranes, Plants, *Analytical techniques, Plant physiology.

Plant material is extracted with 15 N HN03, after which a buffer solution is added and the fluoride activity measured directly. The value of the method is illustrated by the results obtained in a study of fluorine contamination of grasses.--Copyright 1972, Biological Abstracts, Inc.
W72-13391

COLORIMETRIC DETERMINATION OF TOTAL PROTEIN AND NONPROTEIN NITROGEN IN PLANTS,
G. M. Lyaskovskii, S. N. Sergienko, and V. N. Sheredeka.
Tr Khar'Kov S-Kh Inst. Vol 78, No 115, p 49-57. 1969.
Identifiers: Analytical techniques, Amino acids, *Colorimetry, Nessler reagent, *Nitrogen, Nonprotein, *Plants, Physiology, Proteins.

A new modification of N determination with Nessler reagent is described. Digestion of the plant material (by H2S04 with H2O2 added) was followed by trial testing of 1 sample from the batch at different levels of dilution with water. Sodium silicate was added to the solutions, rapidly causing turbidity with the production of complex Ca and Mg compounds. Trichloroacetic acid is recommended for the separating out of proteins to permit the determination of nonprotein N, instead of Zn (OH)2 (which causes partial precipitation of amino acids). The treated solution is best viewed by means of an FEK-56 colorimeter. The N content should not be calculated from a calibration graph, but by the 'limited standards' method.--Copyright 1972, Biological Abstracts, Inc.
W72-13392

MEASUREMENT OF THE RADIOACTIVE CONTAMINATION OF SURFACE WATERS,
Controle Radioprotection, Brussels (Belgium).
For primary bibliographic entry see Field 05B.
W72-13434

BUMINES DATA PROMISE HELP IN IDENTIFYING PETROLEUM-SPILL SOURCES,
Bureau of Mines, Bartlesville, Okla. Bartlesville Energy Research Center.
M. L. Whisman, and F. O. Cotton.
Oil and Gas Journal, Vol 69, No 52, p 111-113, December 27, 1971, 1 tab, 2 ref.

Descriptors: *Oil spills, *Water pollution sources, *Data processing, *Pollutant identification, Water pollution control, Trace elements.

To aid in the apprehension and prosecution of oil pollution violators it is helpful to identify the source of the petroleum. The U. S. Bureau of Mines maintains a data bank on crude oil properties. To augment this data bank, selected properties necessary for source identification were determined on 186 crude oils from important fields throughout the world. Tabulation of these properties is presented. Properties of unknown oil spill samples can be compared with these reference data. Availability of these data will permit the use of a computer program to establish the petroleum source. Additional data on the effects of weathering are still needed for positive isolation and identification of sources. (Ensign-PAI)
W72-13443

AN EVALUATION OF TWO NEUSTON SAMPLERS,
Bedford Inst., Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
E. M. Levy, and A. Walton.
AOL Report No 9, 1971. 11 p, 12 fig, 3 ref.

Descriptors: Research equipment, *Sampling, *Structural design, *Water sampling, *Design standards, Water pollution sources, Oily water, *Oil pollution.
Identifiers: *Neuston samplers.

An investigation was conducted into the design of a towed sampling device for collection of floating oil and tar lumps to be constructed of light, relatively inexpensive materials. Two designs were tested and the 'other surface sampler' constructed by Sameoto and Jaroszynski was most satisfactory. It consisted of an open-ended aluminum frame with a standard plankton net and collection bucket. The side wings, bottom lip, and bridle, all adjustable, made the 26 pound sampler more adequately suited to oil pollution studies. (Ensign-PAI)
W72-13446

NATURAL VIRUS INACTIVATION PROCESSES IN SEAWATER,
Hadassah Medical School Jerusalem (Israel).
For primary bibliographic entry see Field 05B.
W72-13447

VARIATIONS OF SILVER IN THE SEA WATER AROUND MONACO,
International Lab. of Marine Radioactivity, Monte Carlo (Monaco).
For primary bibliographic entry see Field 05B.
W72-13449

RADIOMETRIC DETERMINATION OF TRACE AMOUNTS OF ANIONIC SURFACTANTS IN GROUND WATER AND POTABLE WATER,
Liverpool Polytechnic (England). Dept. of Chemistry.
C. G. Taylor, and J. Waters.
Analyst, Vol 97, No 1156, p 533-541, July 1972. 3 fig, 3 tab, 13 ref.

Descriptors: *Water analysis, *Surfactants, *Tagging, *Radiochemical analysis, Pollutant identification, Radioisotopes, Radioactivity techniques, Chemical analysis.
Identifiers: *Radiometric analysis, Anionic surfactants, Iron radioisotopes.

To analyze for anionic surfactants, the water sample is treated with an excess of ferroin solution labeled with iron-59. The solution is extracted with chloroform and the activity of a portion of the extract is measured. The anionic surfactant content of the sample is determined by the standard addition of sodium lauryl sulphate. The application of the method to river-water and tap-water samples gives results that agree with those obtained by using Abbott's methylene blue method. The method requires 30 minutes for each reading. The overall standard deviation for river-water samples has been calculated to be 4.3 percent at the level of 0.1 ppm of sodium lauryl sulphate. The limit of detection is 0.1 microgram of sodium lauryl sulphate (0.005 ppm in a 20-ml sample). Blanks are minimized by extracting at pH 4 with chloroform equilibrated with water by performing only one extraction, by centrifuging for a fixed period and by removing the extract for counting with a capillary device. Nothing interferes when present at the levels that are normally encoutered in river waters. Potential interferences by fluoride or iron are compensated for by the internal standard. (Knapp-USGS)
W72-13457

FIELD STUDY AND MATHEMATICAL MODEL OF THE SLACK-WATER BUILDUP OF A POLLUTANT IN A TIDAL RIVER,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05B.
W72-13494

MALTING EFFLUENTS,
Newcastle-upon-Tyne Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 05D.
W72-13507

PAPER MILL FIBER AND CHIP TAGGING AND TRACING TECHNIQUE,
Washington State Univ., Pullman. Coll. of Engineering Research Div.; and Washington State Univ., Pullman. Radioisotopes and Radiations Lab.
R. M. Chatters, R. L. Peterson, and R. D. Rice.
Washington State University, Bulletin No. 312, November 1969. 40 p, 15 fig. AEC AT (45-1)-1951.

Descriptors: *Pulp wastes, *Analytical techniques, *Neutron activation analysis, Tracers, Radioactivity techniques, Radioisotopes, On-site tests, Path of pollutants, Pollutant identification.
Identifiers: Metallic salt.

A method was developed for the identification and tracing of one type of wood fiber in the presence of one or more other types of wood fibers. The technique involved treating a small sample of wood chips or fibers with a metallic salt, removal of excess additive, dispersion of the treated chips or pulp into the mill system at any desired point, and subsequent collection of fiber samples downstream in the process lines and effluent streams. Neutron activation analysis techniques were utilized to ascertain the amount, if any, of

treated fibers present in the collected samples. Representive inemill tests in which the technique was employed were presented. (Galwardi-Texas)
W72-13510

HIGH MERCURY AND ANTIMONY CONCENTRATIONS IN CRETACEOUS AND PALEOGENE SEDIMENTS IN THE SOUTHERN KIRGIZ SSR (O POVYSHENNYKH SODERZHANIYAKH RTUTI I SUR'MY V MELOVYKH I PALEOGENOVYKH OTLOZHENIYAKH YUZHNOY KIRGIZII),
Akademiya Nauk Kirgizskoi SSR, Frunze. Institut Geologii.
For primary bibliographic entry see Field 02J.
W72-13597

5B. Sources of Pollution

SANITARY LANDFILLS--A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.

Available from NTIS, Springfield, Va. 22151, as PB-211 565, Price $3.00 paper copy; $0.95 in microfiche. Water Resources Scientific Information Center Report WRSIC 72-214, July 1972. 166 p, 120 ref.

Descriptors: *Bibliographies, *Sanitary engineering, *Landfills, *Water pollution sources, *Abstracts, Information retrieval, Publications, Documentation, Waste disposal, Seepage, Groundwater, Infiltration, Leaching, Public health.
Identifiers: *Sanitary landfills, Landfill pollution effects.

Sanitary landfills is one in a series of bibliographies in water resources produced wholly from the information base comprising only Selected Water Resources Abstracts (SWRA). At the time of search for this bibliography, the data base had 41,521 abstracts covering SWRA through May 15, 1972 (Volume 5, Number 10). A descriptor index is made up of a fraction of the total descriptors and identifiers by which each paper has been indexed. It represents weighted terms that best describe the information content. A comprehensive index represents all of the descriptors and identifiers by which each paper has been indexed. Through permutation, each word in a multiple-word descriptor or identifier is made to file in its normal alphabetic order, thus affording a multiple access to each abstract. Abstracts with full bibliographic details are listed in ascending Accession Number order. An author index is included. (Woodard-USGS)
W72-13043

INTERACTION OF HERBICIDES AND SOIL MICROORGANISMS.
Boyce Thompson Inst. for Plant Research Inc., Yonkers, N.Y.
For primary bibliographic entry see Field 05C.
W72-13044

DETECTION OF ABANDONED UNDERGROUND COAL MINES BY GEOPHYSICAL METHODS.
HRB-Singer, Inc., State College, Pa. Environmental Sciences Branch.

Copy available from GPO Sup Doc EP2.10:14010 EHN 04/71, $1.00; microfiche from NTIS as PB-211 554, $0.95. Environmental Protection Agency Water Pollution Control Research Series, 04/71, April 1971. 95 p, 29 fig, 5 tab, 90 ref. EPA Program 14010 EHN 04/71.

Descriptors: *Water pollution sources, *Coal mine wastes, *Mine drainage, *Surveys, Analytical techniques, Water pollution control, Fractures (Geologic), Locating, Methodology, Remote sensing, Photogrammetry, Electrical resistance, Seismographs.
Identifiers: *Abandoned coal mines.

Acid drainage produced by abandoned coal mines continues to cause serious water pollution problems. Without knowing the exact location of the concealed openings and the extent of the mine, source abatement techniques are virtually impossible. Drilling is the only known method for accurately determining the location and extent of the mine voids, but this is extremely expensive. This project attacks the problem through field studies of the following geophysical methods: electrical resistivity, self-potential, infrared radiometry, total field and differential magnetometry, seismic refraction and reflection, very low frequency electromagnetic and induced polarization over well-documented, drift, coal mines. Airborne infrared radiometry proved to be an excellent tool for detecting and mapping acid mine/fresh water sources, acid mine/ fresh water drainage, and fracture traces under selected conditions. Resistivity and magnetics anomalies coincide with some drift mine entries. Induced polarization data show some correlations with mine workings. Other methods tested did not yield correlatable information. Conventional geophysical approaches to this problem do not appear adequate for the task. Unconventional approaches including high frequency seismic, shear wave seismic, and induced polarization methods may provide answers pending their further development. (Woodard-USGS)
W72-13045

DEGRADATION OF UREA IN CONCENTRATED AQUEOUS SOLUTION,
Connecticut Unit., Storrs. School of Pharmacy.
H. L. Welles, A. R. Giaquinto, and R. E. Lindstrom.
Journal of Pharmaceutical Sciences, Vol 60, No 8, p 1212-1216, August 1971. 3 fig, 4 tab, 18 ref. OWRR A-024-CONN (2).

Descriptors: *Water pollution sources, *Chemical reactions, *Urea, *Degradation (Decomposition), *Aqueous solutions, Laboratory tests, Hydrolysis, Temperature, Specific conductivity, Solubility.
Identifiers: Concentrated aqueous solutions.

The degradation of urea in concentrated solutions is a reversible reaction. Accordingly, the overall process will reach an equilibrium at a point in time that is dependent upon the temperature and urea concentration. The indications are that the amount of contaminant produced, presumably in the form of ammonium cyanate, is negligible for many current applications of concentrated urea solutions. Furthermore, unless the experiment demands, and unless the experiment is of relatively short duration, it is pointless to strive for ultrapure urea to be used in preparing concentrated solutions. The observations made show that at 25, 35, and 45 deg, it would take but 23, 2.5, and 1 hr., respectively, for a solution of ultrapure urea to reach the same specific conductance level as the solutions prepared from reagent grade unrecrystallized urea. (Woodard-USGS)
W72-13048

AN INTEGRATED STUDY OF EARTH RESOURCES IN THE STATE OF CALIFORNIA USING REMOTE SENSING TECHNIQUES,
California Univ., Berkeley; California Univ., Irvine; California Univ., Davis; California Univ., Los Angeles; California Univ., Riverside; and California Univ., Santa Barbara.
For primary bibliographic entry see Field 07B.
W72-13052

AN ANNOTATED BIBLIOGRAPHY OF REMOTE SENSING OF AIR AND WATER POLLUTION,
Iowa Univ., Iowa City.
For primary bibliographic entry see Field 05A.
W72-13055

ROLE OF QUINONE GROUPS IN SOLUBILITY AND COMPLEXING OF METALS IN SEDIMENTS AND SOILS,
Bedford Inst., Dartmouth (Nova Scotia). Marine Geology Div.
M. A. Rashid.
Chemical Geology, Vol 9, No 4, p 241-247, June 1972. 1 fig, 2 tab, 28 ref.

Descriptors: *Humic acids, *Chelation, *Organic matter, *Soil chemistry, *Geochemistry, *Biochemistry, Water chemistry, Chemical precipitation, Oxidation, Reduction (Chemical), Trace elements.
Identifiers: *Quinones, *Complexes (Chemical).

Benzoquinone is present in natural humic acids along with other forms of quinone compounds. In laboratory tests it solubilized from 8.3 to 118.8 mg of Cu, Zn, Co, Mn, and Ni per gram of organic matter as compared with 54.0 to 250.0 mg by pure humic acid. From 1.5 to 8.5% of the total metal-solubilizing capacity of humic acid appeared to arise from the reaction of quinones. The infrared analyses suggest that the quinone groups are participating in organometal reactions. The intensity of quinone a absorption was reduced and shifted to lower frequency when benzoquinone reacted with metals. The metal-solubilizing properties of quinones, together with their unusual stability in the geological column, may play a significant role in the concentration of metals in the substrate. (Knapp-USGS)
W72-13059

LAKE WATER QUALITY PREDICTIONS,
Ontario Water Resources Commission, Toronto.
For primary bibliographic entry see Field 05C.
W72-13060

EFFECTS OF TIDAL FLATS ON ESTUARINE WATER QUALITY,
Oregon State Univ., Corvallis.
D. A. Bella, A. E. Ramm, and P. E. Peterson.
Journal of Water Pollution Control Federation, Vol 44, No 4, p 541-556, April 1972. 7 fig, 4 tab, 67 ref.

Descriptors: *Tidal marshes, *Estuaries, *Water quality, Biochemistry, Water chemistry, Dissolved oxygen, *Sulfides, Iron, Sulfur bacteria, Aquatic bacteria, Ecology, *Path of pollutants, Sulfite liquors, Pulp wastes, Oxidation-reduction potential.
Identifiers: *Tidal flats.

After defining a conceptual model of a tidal flat system, the production, diffusion, and oxidation of free sulfides within this system are discussed along with the benthal oxygen uptake of tidal flat deposits. Data concerning the vertical distribution within sediments of total aerobic bacteria, sulfate reducing bacteria, total sulfides, redox potential, volatile solids, and particle size are presented. A simplified mathematical model describes the diffusion of dissolved oxygen and free sulfides and their chemical reaction within the aerobic zone of the deposit. Mathematical model and field results demonstrate that both dissolved oxygen and free sulfides may be present in significant quantities within the water above the deposits. (Knapp-USGS)
W72-13063

EXPLORATION OF MULTIPHASE FLUID FLOW IN A SALINE AQUIFER SYSTEM AFFECTED BY GEOTHERMAL HEATING,
Alabama Univ. Dept. of Civil and Mineral Engineering.
For primary bibliographic entry see Field 02F.
W72-13064

EFFLUENT CHARACTERISTICS OF BLEACHED KRAFT PULP MILLS,
British Columbia Research Council Vancouver. Div. of Applied Biology.
For primary bibliographic entry see Field 05C.
W72-13108

RESIDUES OF ORGANOCHLORINE PESTICIDES AND POLYCHLORINATED BIPHENYLS IN SOME COMMERCIALLY PRODUCED CANADIAN MARINE OILS,
Bedford Inst., Dartmouth (Nova Scotia). Marine Ecology Lab.
R. F. Addison, M. E. Zinck, and R. G. Ackman.
Journal of the Fisheries Research Board of Canada, Vol 29, No 4, p 349-355, 1972. 1 fig, 3 tab, 26 ref.

Descriptors: *DDT, *Pesticide residues, *Polychlorinated biphenyls, *Dieldrin, *Oil, Water pollution effects, Chlorinated hydrocarbon pesticides, Aroclors, Herrings, Atlantic Ocean, Path of pollutants, Water pollution, Fish physiology, Antarctic, Public health.
Identifiers: *Whale oil, *Fish oil, *Herring oil, *Seal oil, Seals (Mammals), Seafood.

Herring oils produced in the late 1960s from Gulf of St. Lawrence fish generally contained 7-17 mg/l DDT complex, 0.1 mg/l dieldrin, and up to 11 mg/l PCB's. In spring, oils were richer in residues than in autumn. Seal oils contained up to 8 mg/l DDT complex, and about 4 mg/l PCB's, but no dieldrin. Residue levels showed no marked change from the mid-1950s to mid-1960s. North Atlantic whale oils contained up to 40 mg/l DDT complex, and (in a few samples only) about 7 mg/l PCB's; no dieldrin was found. Some Antarctic whale oils produced about 1950 contained 0.1 mg/l DDT complex and no detectable PCB's. (LeGore-Washington)
W72-13114

THE AUTHORITATIVE PRIMER - GROUND WATER POLLUTION.

Water Well Journal, Vol 24, No 7, July 1970, p 31-67.

Descriptors: *Groundwater, Groundwater movement, *Pollution abatement, *Pollutant identification, *Water wells, Standards, *Governmental interrelations, Injection wells, Legislation.
Identifiers: *Pollution controls, *Certification examinations, Laws, Governmental responsibilities, Availability of groundwater, *Sanitation.

This special issue of Water Well Journal is devoted to the topic of ground water pollution. It is a collection of ideas on the subject which have been published by the Journal for the decade 1960-1970 and is organized into separate articles discussing subdivisions of the topic. Listed separately are acknowledgements and references used in preparation of the issue. (See also W72-09127) (Campbell-NWWA)
W72-13152

ROCK SALT AS AN URBAN TRACER,
Columbia Univ., Palisades, N.Y. Lamont-Doherty Geological Observatory.
W. S. Broecker, B. Schwartz, N. Sloan, and P. Anconda.
Available from the National Technical Information Service as CONF-710531-1, $3.00 in paper copy, $0.95 in microfishe. Paper presented at Street Salting-Urban Water Quality Workshop, State University Water Resources Center, College of Forestry, Syracuse, New York, May 6, 1971. 23 p, 10 fig, 2 tab, 1 ref. AEL AT (11-1)-3135.

Descriptors: *Water quality, *Highway effects, *Groundwater movement, *Tracers, *Groundwater pollution, *Groundwater recharge, Water conservation, Water supply, Municipal water, Time lag, On-site data collections, Sodium chloride, Water analysis, Water chemistry, Trace elements, Deicing, Street runoff, Roads, Snow removal, Highway icing, On-site investigations, Water measurement, Urban hydrology.

Measurements are reported of chloride ion content of surface waters in the suburban area northwest of New York City. The purpose was to determine whether the temporal and geographic distribution of the chloride ion resulting from applications of road deicing salts could be used to determine the time constant for ground water renewal. However, the sodium chloride contained in ground and surface waters of urban areas in the northeast and north central United States is not dominantly derived from this source. The study team hopes to make an estimate of the chloride retention time of the ground water system by refining estimates of the amount of road salt added during the past decade to the drainage basin of the Oradell reservoir and comparing this to the annual amount of chloride ion leaving this basin. Much of the surface drainage from Rockland County and Northern Bergen County passes through the Oradell Reservoir. Records and data on salt spreading operations in these areas were studied. The preliminary study clearly showed that chloride ion added to the ground waters of the New York area provides a valuable indicator of the retention time of soluble pollutants in the ground water system. This tracer can be used on a time scale of years (the exponential rise of salt usage), of months (the seasonal usage of salt) and of hours (the change in chloride produced by a single rain). Such information is necessary to any study of the flow of more hazardous pollutants through these systems. (Poertner)
W72-13164

TOXICITY OF COMBINED CHLORINE RESIDUALS TO FRESHWATER FISH,
Michigan Dept. of Natural Resources, Lansing. Water Resources Commission.
For primary bibliographic entry see Field 05C.
W72-13174

MECHANISM OF DEGRADATION OF WOOD AND PULP PRODUCTS IN WATER SOLUTION,
Arizona Univ., Tucson. Dept. of Chemistry.
C. Steelink, and S. I. Clove.
Available from the National Technical Information Service as PB-211 645, $3.00 in paper copy, $0.95 in microfiche. Completion Report, August 3, 1972. 5 p, 1 ref. OWRR A-033-ARIZ (1).

Descriptors: *Lignin, *Pulp wastes, Fungi, Degradation (Decomposition).
Identifiers: *Fungal degradation, *Alkaline degradation, *Quinones, *Polyporus spp.

The degradation of wood and pulp products was carried out by two methods: microbiological and chemical. Each method was used to determine the nature of the degradation products and the types of experimental conditions which would favor optimum decomposition of the lignin macromolecule, the intractable part of the waste material. A number of wood-rotting fungi were cultivated on various phenolic substrates..The POLYPORUS species were shown to be most active in their ability to degrade these substances. Commercial lignin preparations were subsequently used as substrates. The low-molecular weight fractions were preferentially degraded by the POLYPORUS species. Another series of experiments focused on the formation of dark-colored substances in wood and pulp sclutions. The identities of some of these chromophores was established, and the mechanism by which they are formed was elucidated. Alkaline processing of hardwood tissue results in effluents which contain quinones, some of which have antibacterial properties.
W72-13181

SOME ASPECTS OF ANALYZING TRANSVERSE DIFFUSION IN RIVERS,
Illinois Univ., Urbana. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02E.
W72-13202

NONIONIC DETERGENT DEGRADATION: III. INITIAL MECHANISM OF THE DEGRADATION,
Laboratory of the Government Chemist, London (England).
S. J. Patterson, C. C. Scott, and K. B. E. Tucker.
Journal of American Oil Chemists' Society, Vol 47, No 2, February 1970, p 37-41. 1 fig, 3 tab, 9 ref.

Descriptors: *Detergents, *Degradation (Decomposition), *Analytical techniques, *Chromatography, Oxidation, Hydrolysis, Hydrogen ion concentration, Water pollution sources, Pollutant identification.
Identifiers: *Thin layer chromatography, Alcohol ethoxylates, Alkyl phenol ethoxylates.

The initial mechanism of degradation of a number of commercially available alcohol polyethoxylates and alkylphenol polyethoxylates was investigated utilizing thin layer chromatography. Results showed that in the case of the readily degradable alcohol ethoxylates, two distinct mechanisms proceed simultaneously: a fission of the molecule into hydrophobic and hydrophibic entities, and a rapid oxidation of the hydrophobic group. No fission occurred in the case of the alkyl phenol ethoxylates, the more usual route of degradation being slow oxidation and hydrolysis of the alkyl groups, the aromatic ring and the ethoxy chain simultaneously. Occasionally, and at higher pH values, the hydrolysis of the ethoxy chain proceeded at a considerable increased rate. (Galwardi-Texas)
W72-13246

ON THE HYDROGEOLOGY OF THE COASTAL REGION OF SOUTHEASTERN FINLAND,
Geological Survey of Finland, Otaniemi.
For primary bibliographic entry see Field 04B.
W72-13265

ANALYSIS OF A NETWORK-MODEL FOR DISPERSIVE FLOW,
Hebrew Univ., Jerusalem (Israel).
For primary bibliographic entry see Field 02F.
W72-13267

RADIOLOGICAL SURVEYS OF PEARL HARBOR, HAWAII, AND ENVIRONS, 1966-1968,
Eastern Environmental Radiation Lab., Montgomery, Ala.
D. F. Cahill, H. D. Harvey, Jr., D. C. McCurry, W. D. Breakfield, and A. A. Moghissi.
Radiation Data and Reports, Vol 13, No 6, p 323-334, June 1972. 8 fig, 3 tab, 7 ref.

Descriptors: *Nuclear wastes, *Nuclear energy, *Submarines, *Harbors, *Water pollution sources, Sediments, Investigations, Sampling, Radioactive wastes, Water pollution effects, Radioactivity, Radiochemical analysis, Data collections, Environmental effects, Ecology, Cobalt radioisotopes.
Identifiers: *Pearl Harbor (Hawaii), Cobalt-60.

From April 1966 through June 1968, surveys were undertaken to determine whether nuclear submarine operations, which include berthing, repair, and servicing, had resulted in radioactivity levels in the harbor which could contribute a detectable radiation exposure to the public. The conduct of the onsite surveys performed at Pearl Harbor are described. Small but detectable quantities of cobalt-60 were found exclusively in the sediment phases of the harbor. Neither the harbor water nor any other environmental samples contained detectable cobalt-60 activity. The total amount of cobalt-60 in the harbor sediment is small compared to the natural radioactivity present in Pearl Harbor and decreased significantly from 1966 to 1968. The levels of cobalt-60 activity in the harbor were well below levels that could contribute a detectable radiation exposure to the public and do not constitute a hazard to public health or the environment. Cobalt-60 and possibly other neutron-activated corrosion products are released in a form which is not biologically available to marine or other forms of life. (Woodard-USGS)
W72-13271

A REVIEW OF CARBON MONOXIDE SOURCES, SINKS, AND CONCENTRATIONS IN THE EARTH'S ATMOSPHERE,
General Electric Co., Philadelphia, Pa.
M. H. Bortner, R. H. Kummler, and L. S. Jaffe.
Available from NTIS, Springfield, Va 22151- NASA CR-2081 Price $3.00 paper copy, $0.95 in microfiche. National Aeronautics and Space Administration Contractor Report NASA CR-2081, June 1972. 51 p, 15 fig, 6 tab, 74 ref. NASI-10139.

Descriptors: *Carbon, *Gases, *Toxins, *Atmosphere, *Hydrologic cycle, Environmental effects, Rain water, Oceans, Surface waters, Path of pollutants, Air pollution, Water pollution sources, Self-purification, Water chemistry, Chemical reactions.
Identifiers: *Carbon monoxide, Biological sinks.

Carbon monoxide (CO) is a toxic pollutant which is continually introduced into the earth's atmosphere. There are apparently some mechanisms operating which destroy most of the CO in the atmosphere, i.e., a carbon monoxide 'sink.' The various possible removal mechanisms which warrant serious consideration are discussed. Particular emphasis is given to chemical reactions, soil bacteria and other biological action, and transport effects. The sources of CO, both natural and anthropogenic, are reviewed. Atmospheric CO concentrations and their implications on the hydrologic cycle are discussed. (Woodard-USGS)
W72-13273

TRAVELTIME AND CONCENTRATION ATTENUATION OF A SOLUBLE DYE IN THE MONOCACY RIVER, MARYLAND,
Geological Survey, Parkville, Md.
K. R. Taylor.
Maryland Geological Survey Information Circular 9, 1970. 23 p, 9 fig, 4 tab, 7 ref.

Descriptors: Water pollution sources, *Tracking techniques, *Fluorescent dye, *Path of pollutants, *Maryland, Rivers, Tracers, Streamflow, Flow rates, Industrial wastes, Travel time, Forecasting, Analytical techniques, Water quality control.
Identifiers: *Monocacy River (Md).

Three time-of-travel studies using a fluorescent dye were made on the Monocacy River in Maryland during 1967 and 1968 at flow-duration points of approximately 95%, 70%, and 35%. Time-distance relations are defined by these studies for a range of discharges from 100 cfs to 1,000 cfs at the index gage. These relationships will enable water users to predict the traveltimes of the leading edge, peak concentration, and trailing edge of a soluble contaminant spilled into the river. Graphs are used to predict that the maximum concentration expected at the Frederick filtration plant resulting from a contaminant spill at Keysville Road bridge at an index flow of 100 cfs is only 20% greater than that expected for a similar spill at an index flow of 400 cfs. At 100 cfs flow, the time required for the contaminant to pass the filtration plant intakes is over four times as long as that for a flow of 400 cfs. At an index flow of 100 cfs, over 30 days would be required to flush the river of a contaminant spilled at the Maryland-Pennsylvania State line. (Woodard-USGS)
W72-13277

EROSION OF SOME BULGARIAN SOILS BY IRRIGATION (IRRIGATSIONNAYA EROZIYA PRI SAMOTECHNOM OROSHENII NEKOTORYKH POCHV BOLGARII),
Institute of Water Engineering and Land Improvement, Sofia (Bulgaria).
For primary bibliographic entry see Field 02J.
W72-13283

CONTENT OF TOXIC SALTS IN WATER EXTRACTS AND SOIL SOLUTIONS OF GYPSUM--BEARING SOILS IN THE GOLODNAYA STEPPE (SODERZHANIYE TOKSICHNYKH SOLEY V VODNYKH VYTYAZHKAKH I V POCHVENNYKH RASTVORAKH GIPSONOSNYKH POCHV GOLODNOY STEPI),
Akademiya Nauk SSSR, Moscow. Pochvennyi Institut.
For primary bibliographic entry see Field 02G.
W72-13285

SEDIMENT WATER INTERACTIONS IN SOME GEORGIA RIVERS AND ESTUARIES,
Georgia Inst. of Tech., Atlanta, Environmental Resources Center.
For primary bibliographic entry see Field 02K.
W72-13299

A PREDICTIVE MODEL FOR THERMAL STRATIFICATION AND WATER QUALITY IN RESERVOIRS,
Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons' Lab. for Water Resources and Hydrodynamics.
M. Markofsky, and D. R. F. Harleman.
Available from GPO Sup Doc EP2.10:16130-DJH-01/71, $2.00; microfiche from NTIS as PB-211 621, $0.95. Environmental Protectis Agency Water Pollution Control, Research Series, January 1971. 283 p, 77 fig, 8 tab, 57 ref. EPA Program 16130 DJH 01/71.

Descriptors: *Reservoirs, *Density stratification, *Water quality, Forecasting, Mathematical models, Flow characteristics, Dye releases, Laboratory tests, Model studies, Estimating, Thermal pollution, Path of pollutants.

Modifications are made on a one-dimensional analytical thermal stratification prediction method to include the time required for the inflowing water to reach the dam face. A one-dimensional water quality model is developed which incorporates the internal flow pattern predicted for a stratified reservoir from the temperature model. The water quality model is designed to predict the concentration of particular water quality parameters in the outflow water as a laboratory reservoir. Good agreement is obtained between measured and predicted concentration values. The application of the mathematical model to a field case of practical interest is demonstrated by solving the coupled set of water quality equations for B.O.D. and D.O. predictions in Fontana Reservoir. Direct comparisons of the water quality model predictions with the field measurements are limited by the lack of input data. A sensitivity analysis to various assumptions on the input data is made in order to illustrate the mechanics of the water quality prediction model. It is concluded that the model is capable of predicting the effect of reservoir impoundments on water quality. (Eagle-Vanderbilt)
W72-13309

PREDICTIONS OF TEMPERATURE IN STREAMS RECEIVING THERMAL DISCHARGES BY USING A DETERMINISTIC MODEL AND COMPUTER TECHNIQUE,
F. Berger, and W. Schmitz.
Preprint 6th International Water Pollution Research Conference, Session 1, Hall A, Paper No. 2, June 19, 1972. 7 fig, 4 ref.

Descriptors: *Water temperature, *Streams, *Thermal pollution, *Computers, Mixing, Heat budget, Mathematical models, Thermal powerplants, Weather, Planning.
Identifiers: *Rhine River.

The effect of a thermal discharge into a river on the temperature of the water is not only due to mixing, but to interference with the natural heat budget of the flowing water. The principle of including the heat budget into the calculations was applied in a study to predict temperature changes expected to occur in the River Rhine between the mouth of the tributary Aare and the city of Basel after the installation of power plants in the future. The calculations of temperatures are made on a computer in the form of a one-dimensional deterministic model assuming some simplification of natural events. The temperature of the water at one-hour intervals was calculated for varying weather conditions, combinations of run-off, and initial water temperatures. Temperatures at the farthest point can be predicted to give the expectancy in number of days of exceeding certain water temperatures. Temperatures calculated from the model are in good agreement with water temperatures recorded at the Aare confluence and at Basel for observed weather conditions. The predictions can give an estimate of the duration that restrictions will be necessary on proposed powerplants if a particular upper limit of water temperature is required. (Eagle-Vanderbilt)
W72-13310

MIXING OF MERGING BUOYANT JETS FROM A MANIFOLD IN STAGNANT RECEIVING WATER OF UNIFORM DENSITY,
California Univ., Berkeley. Hydraulic Engineering Lab.
P. Liseth.
Technical Report HEL 23-1, November 1970. 181 p, 39 fig, 27 ref.

Descriptors: *Design criteria, *Outlets, *Jets, *Waste disposal, *Model studies, *Discharge coefficient, *Buoyancy, *Mixing, Waste dilution, Diffusion, Velocity.
Identifiers: *Manifold, *Merging buoyant jets, Port spacing, Port size.

The mixing of buoyant jets from a long manifold discharging into a stagnant body of water of uniform density has been studied by means of hydraulic model experiments, in order to provide the basis for design of a manifold with respect to port spacing, port size and discharge velocity of the jets. The dilution and flow pattern of buoyant jets from a manifold is altered if merging of the jets takes place. The ratio between vertical distance y above the manifoldto the port spacing L, is determines the effects of merging. For values of y/L between 9 and 5 no significant differences in the center dilution was observed as compared to that of a single jet. For y/L greater than 5 the jets gradually merged into a two-dimensional plume, cuasing a rapid reduction in the center dilution of jets, which is highest for y/L from 5 to 10. (Oleszkiewicz-Vanderbilt)
W72-13312

AN INVESTIGATION INTO THE EFFECT OF AN INDUSTRIAL HEAT AND MOISTURE SOURCE ON LOCAL ATMOSPHERIC CONDITIONS,
Naval Postgraduate School, Monterey, Calif.
J. C. Draft.
Available from the National Technical Information Service as AD-733 227, $3.00 in paper copy, $0.95 in microfiche. M.S. Thesis, September 1971. 78 p, 40 fig, 2 tab, 7 ref.

Descriptors: *Moisture, *Heat, *Meteorology, *Thermal powerplants, Industrial wastes, Atmosphere, *Air pollution, Temperature, Humidity, Vapor pressure, *Thermal pollution.
Identifiers: Helicopter aerograph, Inversion.

Using a steam generating plant as the source, an investigation was made into the local atmospheric effect of a large industrial heat and moisture source. Measurements were made on the California coast where there are common and persistent inversions. Data collection was attempted with ground- and helicopterborne equipment with a final resort to the helicopter when the ground equipment collection techniques proved unsatisfactory. Temperatures, vapor pressures, and humidity were measured. Mixing ratios were generated and vertical cross sections of temperature and mixing ratio were used to display the data. The effect of emissions from a steam power plant appears to be very strongly tied to the position of the inversion with respect to stack height and also to cloud structure, if clouds are present. If the inversion is above stack level, the base appears to be lowered in the vicinity of the source. If clouds are present, the emitted moisture tends to thicken the clouds or at least lower the cloud bases and probably the associated inversion. If the inversion base is below the stack level or there is no inversion, then it appears that the wind regime becomes important. It is apparent that the atmospheric moisture content is much more sensitive to the discharges of the stacks than is the temperature structure. (Eagle-Vanderbilt)
W72-13313

STREAM TEMPERATURE RESPONSE TO THERMAL POLLUTION,
Vanderbilt Univ., Nashville, Tenn. Dept. of Sanitary and Water Resources Engineering.
V. Novotny, and P. A. Krenkel.
Preprint, 6th International Water Pollution Research Conference, Session 1, Hall A, Paper No. 1, June 19, 1972. 7 p, 3 fig, 6 ref.

Descriptors: *Mathematical model, *Temperature, *Thermal pollution, *Streams, Rivers, Streamflow, Heat transfer, Air-water interfaces.
Identifiers: Exchange coefficients.

A mathematical model describing temperature changes in rivers was developed which takes the differences between stream flow and lakes and reservoirs into account. There are many basic differences between these two types of heat transfer phenomena; the most significant one being the dynamic character of the air-water interface where both boundaries are moving. It was concluded that, in most cases, the heat exchange between air and flowing water is governed by the heat, vapor, and radiation exchange rate in the air boundary layer. The heat (vapor) exchange coefficient in the air boundary layer is dependent on a characteristic length of the boundary layer formation and on the vectoral subtraction of the wind and water surface velocities. The heat transfer equation is divided into two simultaneous equations, one describing the natural temperature and the other depicting the steady decay of the thermal load. Costly and sometimes inaccurate measurements of cloud cover, solar radiation, and humidity are not necessary inasmuch as the overall heat exchange coefficient, K, is dependent only on wind velocity, stream surface velocity, air temperature and, to a lesser extent, on the area of the water surface. (Eagle-Vanderbilt)
W72-13315

COLUMBIA RIVER THERMAL EFFECTS STUDY - VOLUME 2 - TEMPERATURE PREDICTION.
Environmental Protection Agency, Seattle, Wash. Region X.

January, 1971, 64 p, 7 fig, 5 tab, 20 ref.

Descriptors: *Water temperature, *Forecasting, *Columbia River, *Mathematical models, Discharge, Reservoirs, Stratification, Climatic data, Hydrology, Estuaries, Meteorology, *Thermal pollution, Water quality standards.
Identifiers: Temperature prediction.

The Columbia River temperature model, consisting of the weakly stratified and the river run reservoir models, has been verified to simulate river temperatures from the Canadian - U.S. border to Bonneville Dam. For six simulations with differing input conditions, the maximum average error was 1.2 F and the maximum standard deviation was 2.4 F. The weakly-stratified reservoir model contributed 12 percent of the total downstream temperature error at the Snake River and 17 percent of the total error at Bonneville Dam. From April through November, 1967, the heat added to the river from the Hanford reactor complex raised the simulated water temperature an average of 2 F at the confluence of the Columbia and Snake Rivers. The river-run model is adequate for simulating tidallyaveraged temperatures in the Columbia River estuary. Evaporation was found to be most significant from the first of August to the end of November. (Upadhyaya-Vanderbilt)
W72-13316

SHAPE FACTORS FOR COOLING LAKES,
Towne School of Civil and Mechanical Engineering, Philadelphia, Pa.
J. E. Edinger.
Journal of the Power Division, American Society of Civil Engineers, Vol. 97, No. PO4, p. 861-867, December 1971. 3 fig, 2 tab, 4 ref.

Descriptors: *Thermal powerplants, *Heated water, Electric power, Intakes, Condensers, Heating, Heat transfer, Advection, Relocation, Temperature, Heat budget, Mathematical models, Dimensions, *Thermal pollution.
Identifiers: *Shape factor, *Cooling ponds.

Cooling lakes have many sidearms and tributary embayments. A method is presented to determine the effective surface area and the amount it would change by changing inlet and discharge locations or by changing plant pumping rates. The lake is divided into a main flow area and a series of sidearm areas and heat transfer relations are applied to each portion. A shape factor is determined from the summation of the heat balance of the sidearms. With this model, various intake-discharge schemes could be evaluated for a lake giving the intake-condenser temperature rise ratio. The principles outlined can be extended to lakes that have a large inflow and outflow compared to plant pumping rate. The relationships apply to lakes where vertical mixing between the plant discharge and river inflow is complete and where there are no substantial density underflows through the lake. The equations could also be used to find the surface temperature distribution. (Eagle-Vanderbilt)
W72-13318

SPRAY POND MATHEMATICAL MODEL FOR COOLING FRESH WATER AND BRINE,
Oklahoma State University, Stillwater. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 05D.
W72-13320

THE CRISIS IN POWER-PLANT SITING,
Oak Ridge National Lab. Tenn.
M. M. Yarosh.
Journal of Mechanical Engineering, p 10-13, June 1971. 3 fig, 2 tab, 15 ref.

Descriptors: *Electric power demand, *Nuclear powerplants, *Planning, *Thermal powerplants, Thermal pollution, Economic feasibility, Political aspects, Air pollution, Resources development, Cooling towers, Offshore platforms, Islands, Radioactivity, Safety, Water pollution.
Identifiers: *Fossil-fuel powerplants, Underground power transmission.

If future power shortages are to be averted in the United States, approximately 250 new steam electric power plants, each of over 500-Mw capacity, will be required by 1990. Difficulties in finding acceptable sites for these plants are due to economic, safety and environmental constraints. Possible solutions to siting problems such as an underground cryogenic power transmission system and dry-cooling towers are reviewed and found to have limited application. Offshore power plants are viewed as a possible solution to many siting problems. Long-range regional and national planning of energy requirements and sites is necessary and must include assessments of future demands of air, water and land resources, technical research and development, and social, economic and political considerations. Standards and guidelines for electric utilities, methods of streamlining site approvals and greater utility recognition of responsibility concerning environmental problems are also necessary. Figures show how power plant size has increased with time, give projected locations of power plants with above 500-Mw capacity in 1990, and show population near some reactor plants as a function of distance from the plant. Statistics concerning electrical power consumption and sources of air pollution are also included. (Bass-Vanderbilt)
W72-13321

THE CONTROL OF RIVER HEATING BY ACCURATE DIGITAL SIMULATION,
Motor-Columbus Engineering Co., Baden (Switzerland).
For primary bibliographic entry see Field 05G.
W72-13322

NUCLEAR POWER PLANTS: FEWER AND FARTHER BETWEEN.

Chemical Week, Vol 109, No 18, p 15-16, November 3, 1971. 1 photo.

Descriptors: *Nuclear powerplants, Electric power production, Cooling water, Thermal pollution, Costs, *Chemical Industry.
Identifiers: *Atomic Energy Commission.

A change in AEC certification procedures for nuclear powerplants will bring a short term slowdown in the trend to nuclear power generation. The Atomic Energy Commission decided to accept a court ruling that it scrutinize each nuclear power plant for its total environmental impact, including thermal effects. Previously, AEC certifications were based mainly on such factors as equipment reliability and control of radioactive emissions. The immediate effect will be a delay in the startup of some 120 nuclear power units in various stages of design, construction, and alteration. Implications for the chemical process industries are: (1) a slowdown in demand for fuel, coolants, moderators and other components of nuclear power plants, (2) higher costs of fossil fuels (coal, petroleum and natural gas) and fossil fuel derivatives that are used as chemical feedstocks, (3) spot shortages of low-cost, interruptible power for aluminum smelters, chlor-alkali plants and other large users of electricity. In the long run the nuclear power industry is expected to have a growth rate of roughly 15% per year. (Eagle-Vanderbilt)
W72-13324

'REAL-TIME' THERMAL-PROFILE MONITOR IS GIVEN A CHECKOUT.

Electrical World, p 46-47, January 1, 1972.

Descriptors: *Monitoring, *Temperature, *Thermal pollution, *Electric powerplants, Regulation, Profiles, Electronic equipment, Data collections.

An automated temperature-monitoring system for determining real-time thermal profiles of powerplant water bodies produces data which can be used as an indication whether or not a power plant will meet thermal-discharge requirements and regulations. The monitoring system consists of telemetering buoys and a shore-based data-collection and processing center. In a study at Boston Edison's Pilgrim station, telemetering buoys were located at fixed sites, determined from thermal-plume isotherm maps. Continuous temperature signals were transmitted to shore by underwater cable. The system was found to offer great flexibility in number and location of data buoys. Long periods of unattended operation are possible. (Eagle-Vanderbilt)
W72-13327

PROJECTION AND DISTRIBUTION OF WASTE THERMAL ENERGY,
Rand Corp., Santa Monica, Calif.
S. M. Greenfield.
Available from the National Technical Information Service as AD-731 259, $3.00 in paper copy, $0.95 in microfiche. Rand Paper P-4540, December 1970. 6 p, 2 fig, 1 tab, 1 ref.

Descriptors: *Projections, *Energy loss, *Heat, Spatial distribution, Electric power, Evaporation, Heated water, *Thermal pollution.

The world estimate of total thermal energy available as waste heat for the environment is, at best, crude. The rate of increase of electrical power cannot be distinguished from the total energy used from information available. The rate of increase from 1957 to 1967 and the rate from 1964 to 1967 were examined. The smallest rate is assumed to apply to the period between 1970 and 2000. Projections of thermal waste energy are made for 1970, 1980, and 2000 for worldwide geographic locations, based on a U.N. paper. Projected yearly thermal energy release is also shown for two areas of the U.S., a growing urban area (Los Angeles) and a larger area in North Central New England and the Mid-Atlantic States. It is estimated that 15 to 30 percent of this heat energy will go into the atmosphere by the evaporation-latent heat route and most of the remainder of the heat will go through the sensible heat route. (Eagle-Vanderbilt)
W72-13331

MERCURY IN SEDIMENTS FROM THREE VIRGINIA ESTUARIES,
Virginia Inst. of Marine Science, Gloucester Point.
R. J. Huggett, M. E. Bender, and H. D. Slone.
Chesapeake Sci, Vol 12, No 4, p 280-282, 1971.
Identifiers: *Estuaries, *Mercury, *Sediments, *Virginia, Organic matter, Water pollution sources.

A survey of Hg levels in sediments (< 63 microns) from Virginia's 3 main estuaries was conducted. Results indicated that the Hg was associated with the organic fraction of the bottom material. Statistical analyses showed no differences (5% significance level) within rivers with respect to distance from the mouth or between rivers. Comparison of the estuarine levels to those of oceanic and freshwater sediments show the oceanic to be more closely related to the estuarine with respect to Hg concentrations.--Copyright 1972, Biological Abstracts, Inc.
W72-13336

COMPARISON OF MERCURY LEVELS IN AN OLIGOTROPHIC AND A EUTROPHIC LAKE,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 05C.
W72-13340

ON THE CONTENT OF COBALT IN WATER MEDIUM (K OBSAHU KOBALTU VE VODNIM PROSTREDI),
Vyzkumny Ustav Rybarsky a Hydrobiologicky Vodnany, Prague (Czechoslovakia).
O. Albertova.
Bulletin VUR Vodnany, No 3, p 33-41, 1970. 6 tab, 31 ref. English Summary.

Descriptors: *Cobalt, *Aquatic environment, *Aquatic life, *Reviews, Aquatic plants, Mud, Plankton, Fish, Analytical techniques, Bioassay, Assay, Neutron activation analysis, Colorimetry.
Identifiers: Activation analysis, 2-nitroso-1-naphtol, N-R-S salt.

Literature data concerning cobalt in the water medium are surveyed. Results of determinations of cobalt in experimental organisms after the addition of cobalt to feed and to the water medium are mentioned. Cobalt content in some water plants, in mud, plankton and fish, obtained through activation analysis and colorimetrically through the use of 2-nitroso-1-naphthol and N-R-S salt are presented. The checking of the method of the determination of cobalt content in fish through separation by means of 1-nitroso-2-naphthol, and through direct determination by means of N-R-S salt revealed that only 70% of the cases of cobalt could be found on repetition of the analysis. For this reason, the method could not be used. (Svensson-Washington)
W72-13345

POLLUTION OF WATERS IN CZECH SOCIALIST REPUBLIC IN RELATION TO FISHERIES (ZNECISTOVANI VOD V CSR VE VZTAHU K RYBARSTVI),
Vyzkumny Ustav Rybarsky a Hydrobiologicky Vodnany, Prague (Czechoslovakia).
J. Havelka, and J. Kavalec.
Buletin VUR Vodnany, No 4, p 3-7, 1971. 2 fig. English summary.

Descriptors: *Water pollution sources, *Water pollution control, *Fishing, Analysis, Fisheries, Commercial fishing, Sport fishery.
Identifiers: *Czechoslovakia, Economy, Permanent pollution, Emergency pollutions.

An analysis is presented of the causes and extent of emergency and permanent pollution of waters covered by the Czech Anglers' Union. The analysis contains the proportions of different pollution sources according to the type of production which devastate the waters and cause losses in the fishing economy; these data cover the past five years. At the same time emphasis is laid on the active efforts of the fishing organizations and research in the avoiding and elimination of the losses caused by pollution. (Svensson-Washington)
W72-13346

SLUDGE DUMPING IN THE FIRTH OF CLYDE,
Clyde River Purification Board, East Kilbride (Scotland).
D. W. Mackay, W. Halcrow, and I. Thornton.
Marine Pollution Bulletin, Vol 3, No 1, p 7-11, January 1972. 6 fig, 5 tab, 13 ref.

Descriptors: *Sewage sludge, *Heavy metals, *Estuarine environment, Aquatic animals, Aquatic environment, Trace elements, Lead, Copper, Chromium, Zinc, Nickel, Cadmium, Manganese, Titanium, Sediments, Molybdenum, Industrial wastes, Geochemistry.
Identifiers: Gallium, Silver, Tin, Crangon spp., Pandalus spp., Buccinum spp., *Firth of Clayde.

Sewage sludge contaminated with a variety of heavy metals has been dumped into the Firth of Clyde for some years. Since 1969 a survey of heavy metal contamination of sediments and animals has been carried on. The findings are summarized. Trace elements studied include lead, copper, chromium, zinc, nickel cadmium, manganese, titanium, molybdenum, gallium, silver and tin. All except manganese tended to have higher values in the center of the dumping ground. Copper, lead, tin and zinc showed strong association with organic matter, while cobalt and iron were correlated to a lesser extent, and nickel and manganese appeared to be independent. Animals from near the center of the deposit area contained considerably higher levels of trace elements than those from further afield. The dumping ground showed a marked departure in fauna from its surrounding area. (Svensson-Washington)
W72-13351

THE WATER USE AND MANAGEMENT ASPECTS OF STEAM ELECTRIC POWER GENERATION.
National Water Commission, Arlington, Va. Consulting Panel on Waste Heat.

Available from the National Technical Information Service as PB-210 355, $4.85 in paper copy, $0.95 in microfiche. National Water Commission Report, NWC-EES-72-046, May 1972, 79 p.

Descriptors: *Electric power production, *Thermal pollution, *Electric powerplants, *Cooling water, *Water pollution, *Planning, *Forecasting, Heat transfer, Thermodynamics, Thermal capacity, Aquatic environment, Cooling towers, Consumptive use, Electric power demands, Transmission (Electric), Technology, Research and development.
Identifiers: *Site selection.

The cause, magnitude, and possible effects are assessed of heat discharges to water from steam electric power generation and related aspects of condenser cooling system operation. Attention is focused on electrical energy growth and siting requirements, means of more efficiently using electric energy, problems of concentrated heat release, the lack of an adequate environmental research program for determining thermal effects and setting environmental standards, problems related to increased consumptive use of water, the need to more fully consider aspects of steam electric power generation in water resources planning, and the need to establish in national policy a recognition of the waste assimilative capacity of water. The timing and potential impact of technological developments in power generation, condenser cooling, transmission, new siting alternatives, and beneficial and multiple uses of waste heat are assessed in light of their possible effects on reducing waste heat discharge in the near, intermediate and long term. Recommendations are made with the objective of providing better information for making decisions affecting the near to intermediate term. For the longer term, a greatly expanded R and D effort is recommended. (NWC)
W72-13355

STUDIES ON MINERALIZATION OF UREA IN SOME SOILS OF MYSORE STATE,
University of Agricultural Sciences, Bangalore (India). Microbiology Dept.
R. Siddaramappa, and Rao T. Seshagiri.
Mysore J Agric Sci. Vol 5, No 2, p 150-158. 1971.
Identifiers: Capacity, India, Mineralization, Nitrogen, *Soils, Transformation, *Urea.

In red sandy loam, laterite and black soil the pattern of transformation of added urea at 200, 400 and 800 ppm N under moisture levels of 40, 60 and 80% of maximum water-holding capacity (MWHC) was studied. After incubation at constant temperature (25 C) soil samples drawn at weekly intervals up to the 6th wk were examined

for pH, ammoniacal and nitrate N. Urease activity was determined in the original soils. At 60% MWHC maximum ammoniacal and nitrate N were produced. Transformation was most rapid in laterite soil followed by red and black soils. Rapidity of transformation increased N concentration up to 400 ppm. Urease activity was highest in laterite soil and lowest in black soil.--Copyright 1972, Biological Abstracts, Inc.
W72-13385

EFFECT OF SOIL TYPE AND IRRIGATION METHOD ON LATERAL MOVEMENT OF CYCLOATE,
Oregon State Univ., Corvallis. Dept. of Farm Crops.
C. E. Stanger, and A. P. Appleby, Jr.
Weed Sci. Vol 19, No 6, p 709-711. 1971.
Identifiers: *Carbamate pesticides, *Path of pollutants, Soil treatment, Cycloate, Echinochloa crusgalli M, Grass M, Irrigation effects, Movement, Soils, Soil types.

In greenhouse studies, lateral movement and toxicity of S-ethyl N-ethylthiocyclohexane-carbamate (cycloate) to barnyardgrass (Echinochloa crusgalli (L.) Beauv.) was greater in a loamy sand soil than in two silt loam soils when cycloate was applied by subsurface line injection. Greatest movement and effectiveness resulted from injection into a preirrigated soil without further irrigation. Lateral movement was adequate under furrow irrigation, but the treated band was displaced. Movement of the cycloate was inadequate under sprinkler or subirrigation. Cycloate was more effective when mechanically mixed with the soil than when injected. Cycloate moved more readily in moist soils than in dry soils. When cycloate was injected into a dry loamy sand soil, movement was similar whether irrigation was applied immediately or after 24 hr.--Copyright 1972, Biological Abstracts, Inc.
W72-13388

POLLUTION OF RESERVOIRS BY CARCINOGENIC HYDROCARBONS,
Institut Eksperimentalnoi i Klinicheskoi Onkologii, Moscow (USSR).
A. P. Il'Nitskii, and L. G. Rozhkova.
Vop Onkol. Vol 16, No 7, p 78-82. 1970. Illus. English summary.
Identifiers: *Organic compounds, *Carcinogens, Plankton, Plants, Reservoirs, Silt, USSR, Water pollution, *Benzapyrene.

The results of an investigation of plankton, silt and water plants from reservoirs in Moscow Province are reported. The concentration of benz (a)pyrene (BP) was 4-13 mg/kg in polluted water, 2.5-5 mg/kg in water plants and 1.8-5 mg/kg in silt. In the Moscow river, the BP concentration was 10-100 times higher downstream from the city of Moscow.--Copyright 1972, Biological Abstracts, Inc.
W72-13397

HYGIENIC EVALUATION OF THE APPLICATION CONDITIONS OF HERBICIDES IN RICE GROWING,
Vsesoyuznyi Nauchno-Issledovatelskii Institut Gigieni i Toksikologii Pestitsidov, Kiev (USSR).
V. S. Buryi, V. A. Zakordonets, and N. A. Popovich.
Gig Sanit, Vol 35, No 5, p 98, 1970.
Identifiers: *Path of pollutants, *Herbicides, *Rice M.

Study of a 2756 ha rice field and the effect of its 12-15 m3/sec drainage into the Shavat Canal, which summer flow rate is 100-150 m3/sec, on waters reaching populated areas 5 km downstream indicates that application of the herbicide STAM F-34 at a nominal recommended dose of 6 kg/ha vill yield residual amounts in the canal waters of 0.36 mg/l the day following application, and 0.045 mg/l on the 8th day.--Copyright 1972, Biological Abstracts, Inc.
W72-13408

RESIDUAL ACTIVITY OF PARAQUAT IN SOILS: II. ADSORPTION AND DESORPTION,
Ontario Agricultural Coll., Guelph.
E. M. Watkin, and G. R. Sagar.
Weed Res, Vol 11, No 4, p 247-256, 1971, Illus.
Identifiers: *Pesticide residues, *Adsorption, *Desorption, Lolium perenne M, *Paraquat, Soils, Sphagnum, Toxicity.

Glasshouse studies showed that low doses of paraquat inhibited the germination of Lolium perenne L. broadcast directly onto the paraquat-sprayed surfaces of a sphagnum and a peat soil, but that higher doses were necessary to produce phytotoxic symptoms on mineral soils, a compost and a loam. On all soils residual activity increased rapidly with increasing dose once the minimum phytotoxic dose was reached. On a sandy soil, residual activity increased almost linearly from the lowest to the highest dose applied. At 9.0, 4.5 and 2.24 kg/ha phytotoxicity on a compost was not affected by changes in the volume of application, but at 1.68 kg/ha and lower, reducing the volume from 562 l/ha to 281 and 112 l/ha resulted in increased phytotoxicity. Phytotoxic residues were eluted from paraquat-treated compost surfaces by percolating de-ionized water up soil columns but residual activity was not removed from the eluted surfaces. Surface irrigation of paraquat-treated surfaces with water previously percolated through columns of untreated soil reduced residual activity by 45%.--Copyright 1972, Biological Abstracts, Inc.
W72-13409

DEGRADATION OF BROMOXYNIL IN REGINA HEAVY CLAY,
Department of Agriculture, Saskatoon (Saskatchewan); and Regina Research Station (Saskatchewan).
A. E. Smith.
Weed Res, Vol 11, No 4, p 276-282, 1971, Illus.
Identifiers: *Bromoxynil, Clays, *Degradation (Decomposition), *Herbicides.

A spectrophotometric method was developed to detect bromoxynil in Regina heavy clay, and the breakdown under different temperature and moisture conditions was studied. At rates equivalent to 14 kg/ha, over 50% of the applied bromoxynil was degraded in 2 wk at 25C and at moisture levels in excess of the wilting point. Losses at 18C were slightly slower. Little breakdown occurred in sterile soil, indicating that microbial degradation could be an important factor contributing to bromoxynil breakdown under field conditions. Paper and thin-layer chromatographic techniques were used to isolate and identify soil degradation products. In addition to the parent compound small amounts of 3,5-dibromo-4-hydroxybenzamide and 3,5-dibromo-4-hydroxybenzoic acid were detected.--Copyright 1972, Biological Abstracts, Inc.
W72-13411

AMINO ACID CONTENTS OF THE BRAIN AND THE MUSCLE OF YOUNG SALMON (SALMO SALAR L.) AT PARR AND SMOLT STAGES,
Museum National d'Histoire Naturelle, Paris (France).
M. Fontaine, and J. Marchelidon.
Comp Biochem Physiol A Comp Physiol, Vol 40, No 1A, p 127-134, 1971.
Identifiers: *Fish physiology, *Amino acids, Fish behavior, Brain, Fish migration, Minerals, Muscle, Parr, Regulation, *Salmon, Smolt.

During the parr-smolt transformation of S. salar L. in freshwater, variations in the concentration of some free amino acids in the brain and the muscle were observed. An increase of threonine and glutamine in the brain and a decrease of the total free amino acids--particularly glycine and taurine--in the muscle are especially important. The results are discussed in relation with migratory behavior and hydromineral regulation.--Copyright 1972, Biological Abstracts, Inc.
W72-13416

PLANTS AND INDUSTRIAL WASTE,
Liverpool Univ. (England).
For primary bibliographic entry see Field 05C.
W72-13418

OCEANIC DIFFUSION DIAGRAMS,
Johns Hopkins Univ., Baltimore, Md. Chesapeake.
A. Okubo.
Deep Sea Research, Vol 18, No 8, p 789-802, August 1971. 4 fig, 2 tab, 25 ref.

Descriptors: *Diffusion, *Dye dispersion, *Diffusivity, Dye release, *Tracking techniques, Fluorescent dye, Analytical techniques, *Path of pollutants, Turbulence.
Identifiers: *Diffusion diagrams, Similarity theory of turbulence.

A study of the oceanic diffusion of contaminants utilizing fluorescent dyes was conducted to establish diffusion diagrams for comparative studies and for the prediction of the rate of horizontal spread from a given source. Vertical distribution, velocity field, initial conditions of release, shape information, and background oceanographic and wind conditions were used as basic data standards. The general behavior of horizontal variance and apparent diffusivity varied from the similarity theory of turbulence deductions. (Ensign-PAI)
W72-13433

MEASUREMENT OF THE RADIOACTIVE CONTAMINATION OF SURFACE WATERS,
Controle Radioprotection, Brussels (Belgium).
R. Boulenger.
Ann Gembloux. Vol 77, No 1, p 49-59. 1971.
Identifiers: *Water pollution sources, *Radioactivity, Contamination, Measurement, Radioactive wastes.

The control of radioactive contamination appears to be more simple than that of chemical pollution considering the effect mechanism: the dose of irradiation. However, many agronomical studies should continue to be made in order to determine the advance of radioactive elements through the biological cycles into foods and humans. The main sources of radioactive contamination are nuclear testing, factories were irradiated, nuclear combustibles are treated, nuclear reactors, radioisotope production centers, laboratories where labelling agents are synthesized, factories where minerals rich in natural radioactive elements are treated (for U and Ra production), factories where minerals low in natural radioactive elements are treated for the production of chemical compounds such as fertilizers, and laboratories and hospitals where radioactive elements are used. In the case of nuclear energy (retreatment factories) the discharges into fresh water that are possible are insignificant considering the activities treated. However, factories where so-called 'inactive minerals' are treated should be watched carefully because if these 'inactive minerals' do have a slight activity, the activity will be discharged into the nearby streams. In the case of isotope utilization in medicine and research, discharging of the quantities used into sewers may be done with few precautions (these include storage for a few days before discarding) because of the low half-lives and the low activities used. The means of measuring alpha, beta, and gamma emissions, Ra-226, Sr, and tritium were briefly reviewed.--Copyright 1972, Biological Abstracts, Inc.

W72-13434

FORECASTING THE EFFECTS OF POLLUTING DISCHARGES ON NATURAL WATERS - II, ESTUARIES AND COASTAL WATERS,
Water Pollution Research Lab., Stevenage (England).
A. L. Downing.
International Journal of Environmental Studies, Vol 2, No 3, p 221-226, November 1971. 4 fig, 3 ref.

Descriptors: Water pollution effects, Analytical techniques, *Dispersion, *Salinity, *Radio isotopes, *Forecasting, Water pollution control, Sewage effluents, Water quality, *California, *Estuaries, *Path of pollutants.

A review of current methods for predicting pollution effects on estuaries and coastal waters yielded two basic methods. The distribution of salinity was the basis on which to calculate the rate of dispersion of pollutants in vertically homogeneous estuaries at any given tidal state. Dispersion patterns of polluting discharges in coastal waters were determined with the aid of radio-isotopes. Mathematical models are used and examples are given. (Ensign-PAI)
W72-13437

UPTAKE OF COBALT-58 BY MUSSEL, MYTILUS EDULIS,
Tokyo Univ. (Japan). Dept. of Fisheries.
M. Shimizu, T. Kajihara, I. Suyama, and Y. Hiyama.
Journal of Radiation Research, Vol 12, No 1, p 17-28. March 1971, 8 fig, 6 tab, 9 ref.

Descriptors: Cobalt radioisotopes, Water pollution effects, *Bioindicators, *Shellfish, *Mussels, *Tracers, Fallout, Water pollution, Radioactivity, Analytical techniques.
Identifiers: *Mytilus edulis, *Cobalt-58.

Radioactive contamination studies were conducted using mussel, Mytilus edilus, as an indicator organism and cobalt-58 as a tracer element. Cobalt 58 concentration factors were low in the mantle and adductor muscle, and high in the alimentary tract. High accumulation in the shell and byssus was due to surface adsorption rather than physiological deposition. (Ensign-PAI)
W72-13440

FERTILIZED SEA URCHIN EGGS AS AN INDICATORY MATERIAL FOR MARINE POLLUTION BIOASSAY, PRELIMINARY EXPERIMENTS,
Doshisha Univ., Kyoto (Japan). Biological Lab.
For primary bibliographic entry see Field 05C.
W72-13442

BUMINES DATA PROMISE HELP IN IDENTIFYING PETROLEUM-SPILL SOURCES,
Bureau of Mines, Bartlesville, Okla. Bartlesville Energy Research Center.
For primary bibliographic entry see Field 05A.
W72-13443

DDT INHIBITS NA+, K+, MG2+ -ATPASE IN THE INTESTINAL MUCOSAE AND GILLS OF MARINE TELEOSTS,
Mt. Desert Island Biological Lab., Salisbury Cove, Maine.
For primary bibliographic entry see Field 05C.
W72-13444

INCIDENCE OF R+ ESCHERICHIA COLI IN COASTAL BATHING WATERS OF BRITAIN,
Animal Health Trust, Stock (England). Farm livestock Research Centre.
H. W. Smith.
Nature, Vol 234, No 5325, p 155-156, November 19, 1971.

Descriptors: *Water pollution effects, *Water pollution sources, *Sewage effluents, *E coli, *Coliforms, *Pathogenic bacteria, Recreation, Beaches, Water quality control.
Identifiers: Britain.

Studies of bathing areas contaminated by insufficiently treated human sewage revealed the waters as a possible agent for dissemination of coliforms and pathogenic organisms into the human community. The life span of R+ E. coli in sea water indicated proper sewage treatment as the solution. (Ensign-PAI)
W72-13445

NATURAL VIRUS INACTIVATION PROCESSES IN SEAWATER,
Hadassah Medical School Jerusalem (Israel).
H. I. Shuval, A. Thompson, B. Fattal, S. Cymbalista, and Y. Wiener.
Journal of the Sanitary Engineering Division, American Socity of Civil Engineers, Vol 97, No SA5, p 587-600, October 1971, 5 fig, 3 tab, 18 ref.

Descriptors: *Viruses, *Marine bacteria, *Self-purification, *Bioindicators, *Analytical techniques, *Pollutant identification, Enteric bacteria, Coliforms, Pathogenic bacteria, Water pollution.
Identifiers: Red Sea, Mediterranean Sea.

A study of virus inactivation in seawater revealed biological factors to be the primary mode of inactivation. Enteroviruses were more resistant to natural antiviral activity than coliform organisms. Enteroviruses were detected in polluted coastal areas showing relatively low coliform counts, which suggests further investigation of coliforms as pollution indicator organisms. Fluctuation of physical factors altered the rate of virus inactivation, and no antiviral elements could be demonstrated without the presence of bacteria. (Ensign-PAI)
W72-13447

VARIATIONS OF SILVER IN THE SEA WATER AROUND MONACO,
International Lab. of Marine Radioactivity, Monte Carlo (Monaco).
R. Fukai, and L. Huynh-Ngoc.
Journal of the Oceanographic Society of Japan, Vol 27, No 3, p 91-101, June 1971, 4 fig, 6 tab, 22 ref.

Descriptors: *Radioactive wastes, *Analytical techniques, *Saline water - fresh water interface, *Water pollution sources, Pollutant identification, Fallout, Radioisotopes.
Identifiers: *Silver-110m, *Monaco.

Studies on the radioecological considerations of the silver radionuclides in the marine environment by spectrophotometric analysis revealed the average silver concentration in surface sea water to be 0.14 micro g Ag/l. The maximum concentration of silver in adjacent rivers was estimated at 2.3 micro g/Ag/l of fresh water, offering the possibility of a sea water increase up to 0.09 micro g/Ag/l. This increase was not observed, suggesting the possibility of a silver removal process at the sea water - fresh water interface. (Ensign-PAI)
W72-13449

HOPKINS MARINE STATION,
Stanford Univ., Pacific Grove. Hopkins Marine Station.
J. L. Cox.
California Cooperative Oceanic Fisheries Investigations Reports, State of California Marine Research Committee. Vol 14, p 7-10, September 1970, 2 fig, 1 tab, 19 ref.

Descriptors: *Bioindicators, *Pesticide residues, *DDT, *Nutrient requirements, *Phytoplankton, Pesticide kinetics, Trace elements, Agricultural chemicals, Water pollution effects, Analytical techniques, Polychlorinated biphenyls.

Due to the entrance of DDT into all facets of the world ecosystem, the retention of DDT residues at different levels of the food chain offers a potential indication for the study of energy requirements of pelagic organisms. DDT residue levels in phytoplankton were quantified and varied relative to the carbon content of analyzed samples. Standing crop size at the time of sampling and short term variations in environmental DDT levels significantly affected results. Utilization of DDT as an energy tracer depends upon the effects the variability of phytoplankton DDT concentrations show on the DDT-based estimate of the phytoplankton carbon contribution to consumer growth. (Ensign-PAI)
W72-13450

HAWAII'S SUGAR INDUSTRY FACES TOUGH PROBLEMS.
Environmental Science and Technology Vol 5, No 12, p 1174-1175, December 1971.

Descriptors: *Water pollution sources, *Air pollution sources, *Food processing industry, *Sugar cane, *Industrial wastes, Effluents, Economic feasibility, Water pollution control, *Hawaii.

Increased environmental controls enforced by the Environmental Protection Agency have created economic problems in Hawaii's sugar industry. Immediately effective solutions to marine pollution from inadequately treated mill effluents, and air and water pollution caused by harvesting techniques have been declared economically infeasible. (Ensign-PAI)
W72-13451

JET TYPE MODEL FOR THE THREE-DIMENSIONAL THERMAL PLUME IN A CROSS-CURRENT AND UNDER WIND,
Minnesota Univ., Minneapolis. St. Anthony Falls Hydraulic Lab.
H. Stefan, and P. Vaidyaraman.
Water Resources Research, Vol 8, No 4, p 998-1014, August 1972. 12 fig, 37 ref.

Descriptors: *Mixing, *Jets, *Convection, *Currents (Water), *Path of pollutants, *Mathematical models, *Thermal pollution, Turbulence, Turbulent flow, Heat transfer, Mass transfer, Dispersion.

A dynamic three-dimensional model for predicting water temperatures in a thermal plume was formulated and tested. The plume that results from the discharge of heated water is described in terms of a buoyant, turbulent half jet. The effects of a crosscurrent and wind can be accommodated by the model. Mixing by turbulence, lateral spread due to buoyancy, heat transfer at the water surface, and deflection of the main trajectory under wind shear stress in a current are accounted for. Although it was necessary to make several broad assumptions, for example that all cross-sectional temperature distributions are similar and that there is no distortion of the cross section by wind, the results show the overall behavior of the plume reasonably well. The model does not account for the effects of solid boundaries; its main features are its simplicity and comprehensiveness, its combination of the several processes having a major effect on plume behavior, and its ability to include possible future experimental or theoretical results without major changes in the program. (Knapp-USGS)
W72-13472

TURBULENT TRANSFER AND MIXING OF SUBMERGED HEATED WATER JET,
Rutgers - The State Univ., New Brunswick, N.J. Ballantine Hydrodynamics Lab.
E. L. Bourodimos.
Water Resources Research, Vol 8, No 4, p 982-997, August 1972. 9 fig, 2 tab, 44 ref.

Descriptors: *Mixing, *Mass transfer, *Convection, *Jets, *Path of pollutants, *Thermal pollution, Turbulence, Turbulent flow, Heat transfer, Dispersion, *New York.
Identifiers: *Hudson River (NY).

The turbulent diffusion, transfer, and mixing of a warm submerged jet discharged horizontally into a body of water of different temperature in a river or lake are analyzed. When a jet of heated effluent is discharged into a receiving body of water at some depth below its surface, it rises as a plume to the surface and then spreads laterally and longitudinally at the free surface. The rising of the plume is a combination of both the initial momentum flux and the net buoyant force due to the difference in density between the heated effluent and the surrounding ambient flow water. On the basis of conservation laws for heat, mass, and momentum transfer, numerical solutions were developed and compared with existing experimental data. The practical objective of this analysis is to find the parameters of turbulent mixing, entrainment, and dilution and thereby to establish theoretical and practical engineering criteria for preventing thermal discharges. The results of these numerical model techniques (suitable for high-speed digital computation) have already been successfully employed in predicting patterns of actual hydrodynamics and thermal behavior of heated jet discharges from powerplants along the Hudson Estuary and River in New York. (Knapp-USGS)
W72-13473

ON AN AERIAL MEASUREMENT OF RADIATIVE TEMPERATURE PATTERNS OVER THE THERMAL POLLUTED WATER (IN JAPANESE),
Toba Merchant Marine Coll. (Japan).
H. Ochiai.
UMI to SORA, The Marine Meteorological Society, The Kobe Marine Observatory, Nakayamate, Ikuta-ku, Kobe, Japan, Vol 46, No 3-4, p 67-75, March 1971. 12 fig, 4 ref.

Descriptors: *Thermal pollution, *Hydroelectric plants, *Water pollution sources, *Thermal properties, Thermocline, Water pollution, Infrared radiation, Analytical techniques.
Identifiers: *Owase Bay, *Japan.

Studies on thermal pollution in Owase Bay waters were conducted with infrared thermography and infrared thermometers. Thermal effluent from steam generators extended up to 1500 meters as a surface layer, with temperatures up to 34C near the discharge point. The thermal gradient at the edge of the hot effluent was 4C/10 m. The thermal effluent and its distribution were effected by the tidal current from the Naka River. (Ensign-PAI)
W72-13483

OIL POLLUTION - CAUSES AND CURES,
International Tanker Owners Pollution Federation Ltd., London (England).
J. Wardley-Smith.
Engineering, Vol 211, No 6, p 644-648, September 1971. 5 fig.

Descriptors: *Oil pollution, *Oil spills, *Water pollution sources, *Water pollution control, *Water pollution treatment, Cleaning, Chemicals, Gels, Burning, Salvage value, Absorption, Mechanical control.

The tremendous increase in international shipping has brought a parallel increase in the frequency and severity of oil spills. Various means of dispersal and removal from spill sites have been attempted, including salvage, burning, chemical dispersants and absorbants, and mechanical containment and removal. Floating booms represented the currently preferred method for combating floating oil slicks. (Ensign-PAI)
W72-13484

A COASTAL POLLUTION PROBLEM AND ITS SOLUTION - THE DESIGN AND CONSTRUCTION OF A SUBMARINE SEWER OUTFALL AT EASTBOURNE,
For primary bibliographic entry see Field 05D.
W72-13485

TRACE ELEMENTS DETAILED IN LAKE MICHIGAN.
Chemical and Engineering News, Vol 50, No 30, p 59, July 24, 1972.

Descriptors: *Radioactive wastes, *Trace elements, *Lake Michigan, *On-site data collection, Nuclear powerplants, Sediments, Phytoplankton, Zooplankton, Benthos, Analytical techniques, *Path of pollutants, Water pollution sources.
Identifiers: Scandium concentrations.

The distribution of 35 trace elements in Lake Michigan water, sediment and three levels of invertebrates-phytoplankton, zooplankton and benthos was determined in order to see if there were possible radioactivity hazards to Lake Michigan from nuclear power plants now operating or being constructed. It was concluded that there would be no hazards if the plants operate in accordance with Atomic Energy Commission guidelines. The study showed that elements released in radioisotope form do not continually increase in concentrations up through the food chain. The study required the development of a method based on scandium concentrations in sedimentation and biological material, to correct for the masking effect of sediment contaminating samples. (Galwardi-Texas)
W72-13489

FIELD STUDY AND MATHEMATICAL MODEL OF THE SLACK-WATER BUILDUP OF A POLLUTANT IN A TIDAL RIVER,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
W. J. Grenney, and D. A. Bella.
Limnology and Oceanography, Vol 17, No 2, March 1972, p 229-236. 7 fig, 7 ref.

Descriptors: *Pollutant identification, *Mathematical models, *Tracers, *Tidal waters, Tidal effects, Outlet works, Effluents, On-site data collections, Diffusion, *Oregon, *Path of pollutants, Water pollution sources.
Identifiers: Dispersion coefficient, Rhodamine B tracer, *Yaquina River (Oregon).

The accumulation of a pollutant in the vicinity of an outfall during slack-water periods in a tidal river was studied through a field investigation and a mathematical model. A diffuser was installed across the main channel of the Yaquina River and 35 km from the mouth at Newport, Oregon. Rhodamine-B was injected at a constant rate for 10 hours and over 400 water samples were taken. The data indicate a significant buildup during periods of slack water. A one-dimensional, time dependent, finite-difference model developed for the field study simulated average trends reasonably well, but calculated peak values were consistently lower than field observations. Concentration profiles from the model were sensitive to the dispersion coefficient and the grid parameters when large concentration gradients were present. (Galwardi-Texas)
W72-13494

POLLUTION IN AREAS NEAR THE POMPANO BEACH SEWAGE OUTFALL,
Florida Atlantic Univ., Boca Raton. Dept. of Biological Sciences.
H. A. Hoffmann.
Quarterly Journal of the Florida Academy of Sciences, Vol 34, No 3-4, September-December 1971, p 243-256. 5 fig, 4 tab, 12 ref.

Descriptors: *Pollutant identification, *Coliforms, *Sewage effluents, Ocean circulation, Ocean currents, *Florida, *Outlets, Sewage disposal, Mathematical studies, *Path of pollutants.
Identifiers: Marine outfall, *Pompano Beach (Florida).

Studies were described which attempt to predict the extent of pollution from a marine sewage outfall in a location where the affected areas were subject to possible pollution from a second source, an Intracoastal Canal. The data obtained from coliform counts combined with measurements of the Florida Current strongly indicated that existing and planned marine outfalls on the southeast coast of Florida do and will contribute low levels of pollution to off-shore and beach waters. Mathematical relations were obtained between coliform counts and distance from the outfall. (Galwardi-Texas)
W72-13504

PAPER MILL FIBER AND CHIP TAGGING AND TRACING TECHNIQUE,
Washington State Univ., Pullman. Coll. of Engineering Research Div.; and Washington State Univ., Pullman. Radioisotopes and Radiations Lab.
For primary bibliographic entry see Field 05A.
W72-13510

POPULATION GROWTH AND NONINDUSTRIAL WATER POLLUTION,
For primary bibliographic entry see Field 05G.
W72-13558

POLYCHLORINATED BIPHENYLS AND THE ENVIRONMENT.
For primary bibliographic entry see Field 05C.
W72-13569

MEASUREMENT OF VELOCITY-CONCENTRATION COVARIANCE,
Geological Survey, Bay St. Louis, Miss.
R. S. McQuivey, and T. N. Keefer.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 98, No HY9, Paper 9184, p 1625-1646, September 1972. 13 fig, 4 tab, 12 ref, append.

Descriptors: *Mixing, *Diffusion, *Dispersion, *Path of pollutants, *Instrumentation, Mass transfer, Turbulence, Conductivity, Velocity, Turbulent flow, Roughness (Hydraulic).
Identifiers: *Hot-film anemometers.

A single-electrode conductivity probe in a bridge circuit and a hot-film sensor and anemometer were used to make the first known measurements of the longitudinal velocity-concentration covariance along a diffusing plume in a flow. The measurements were made in a 3.87-ft wide flume over three boundary roughnesses. From these measurements the Boussinesq-type mass transfer coefficient was directly evaluated and compared with the longitudinal-diffusion coefficients obtained from a floating-particle study at the water surface. Within experimental accuracy, the Boussinesq-type transfer coefficient is an adequate model for describing the scalar transport process. (Knapp-USGS)
W72-13574

HELE-SHAW MODEL OF LONG ISLAND AQUIFER SYSTEM,
Southern Methodist Univ., Dallas, Tex. Inst. of Tech.
For primary bibliographic entry see Field 02F.
W72-13578

OBSERVED AND CALCULATED DISTRIBUTION OF LINDANE IN SOIL COLUMNS AS INFLUENCED BY WATER MOVEMENT,
California Univ., Riverside. Dept. of Soil Science.
F. Huggenberger, J. Letey, and W. J. Farmer.
Soil Science Society of America Proceedings, Vol 36, No 4, p 544-548, July-August 1972. 7 fig, 4 tab, 9 ref.

Descriptors: *Path of pollutants, *Mass transfer, *Adsorption, *Pesticide residues, *Soil water movement, Ion exchange, Leaching, Organic matter, Infiltration, Mathematical models.
Identifiers: *Lindane.

Observed and calculated distribution of lindane in soil columns of infiltration experiments were compared. Three mineral soils with different organic matter contents and particle size distributions were used in the study. The adsorption coefficient and rate of adsorption were determined in independent experiments. As predicted by the theory, application of a greater amount of lindane to the soil surface increased the concentration of lindane but did not influence the depth of penetration. Under leaching conditions, the depth of water penetration divided by the adsorption coefficient was a good estimate of the observed depth of maximum concentration of lindane. The theory failed in general to predict the shape of the distribution curve of lindane. (Knapp-USGS)
W72-13580

INFLUENCE OF WATER AND TEMPERATURE ON ADSORPTION OF PARATHION BY SOILS,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel).
B. Yaron, and S. Saltzman.
Soil Science Society of American Proceedings, Vol 36, No 4, p 583-586, July-August 1972. 6 fig, 2 tab, 13 ref.

Descriptors: *Pesticide residues, *Adsorption, *Soil water, *Path of pollutants, Pesticide kinetics, Soil chemistry, Soil physics, Temperature, Hydration, Organic matter, Solubility, Carbon radioisotopes, Tracers.
Identifiers: *Parathion.

Temperature and water effect on the adsorption of parathion by soils was studied using parathion tagged with C-14. The parathion was applied in aqueous solutions and in hexane over a concentration range of 1-10 micrograms/ml. The parathion is adsorbed by soils from aqueous solution without any appreciable thermic effect. In a dry soil-hexane-parathion system the slightly polar parathion molecules efficiently compete with the apolar hexane molecules for adsorption sites. In hydrated soil-hexane-parathion systems there was no parathion adsorption. Generally as the soil water content increases, parathion adsorption decreases. Rise of temperature in the soil-hydrated parathion-hexane system favors the endothermic process of water desorption, resulting in greater free adsorption sites, and consequently, in increasing parathion adsorption. (Knapp-USGS)
W72-13581

RELATION OF SUSPENDED ORGANIC MATTER, BOTTOM SEDIMENTS, AND BENTHOS TO BIOLOGICAL PRODUCTION (SVYAZ' ORGANICHESKOGO VESHCHESTVA VZVESI, DONNYKH OSADKOV I BENTOSA S BIOLOGICHESKOY PRODUKTIVNOST'YU),
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
For primary bibliographic entry see Field 02J.
W72-13594

5C. Effects of Pollution

INTERACTION OF HERBICIDES AND SOIL MICROORGANISMS.
Boyce Thompson Inst. for Plant Research Inc., Yonkers, N.Y.

Copy available from GPO Sup Doc, EP2.10:16060 DMP 03/71, $0.75; microfiche from NTIS as PB-211 566, $0.95. Environmental Protection Agency Water Pollution Control Research, March 1971. 73 p, 6 fig, 17 tab, 36 ref. EPA Program 16060 DMP 03/71.

Descriptors: *Water pollution effects, *Herbicides, *Soil-water-plant relationships, *Microorganisms, Investigations, Analytical techniques, Soil water, Chemical reactions, Soil properties, Nutrients, Pesticide toxicity.
Identifiers: DCPA, IPC.

In pure culture and in soils the addition of 2,3,5,6-tetrachloroterephthalate (DCPA) had little effect upon bacterial growth, and several microorganisms appeared to utilize the herbicide as a carbon source. Methyl-2,3,5,6-tetrachloroterephthalate and 2,3,5,6-tetrachloroterephthalic acid were identified as degradation products. The encouragement of the soil microflora by the addition of nutrient broths resulted in a reduction of toxicity to plants of a number of herbicides. These results indicate that the decontamination of soil by the degradative activities of the natural microflora may be accelerated by the addition of suitable nutrient sources. Isopropyl N-phenylcarbamate (IPC) degrading organisms, when added to soil, accelerated the degradation of IPC and related compounds. A membrane 'biological filter' device for reducing waterborne biodegradable pollutants was also demonstrated using these organisms. (Woodard-USGS)
W72-13044

EFFECTS OF NONIONIC SURFACTANTS ON MONOCOTS,
California Univ., Riverside. Dept. of Plant Pathology; and California Univ., Riverside. Dept. of Soils and Plant Nutrition.
R. M. Endo, J. Letey, N. Valoras, and J. F. Osborn.
Agronomy Journal, Vol 61, p 850-854, November-December 1969. 11 fig, 13 ref. OWRR B-072-CAL (2).

Descriptors: *Water pollution sources, *Surfactants, *Water pollution effects, *Soil-water-plant relationships, *Monocots, Agronomy, Barley, Grasses, Toxicity, Investigations, Experimental farms.

The effects of two commercial nonionic surfactants, Aqua Gro and Soil Penetrant, on seed germination, shoot growth, and root growth of various monocots were investigated in solution culture and soil. Plant species included in the studies were barley, common ryegrass, creeping bentgrass, Kentucky bluegrass, tall fescue, and common bermuda. Both surfactants were more toxic to plants in solution as compared to soil. This was because of adsorption of surfactant by soil thus reducing its toxicity. Other than a few specific exceptions, Soil Penetrant was more toxic than Aqua Gro -- especially in the soil experiments. The mode of action of either surfactant is not known, but the cytological observations suggest that the effects may be on cellular membranes. (Woodard-USGS)
W72-13050

IRON AND MANGANESE PROFILES IN A COASTAL POND WITH AN ANOXIC ZONE,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 05A.
W72-13057

LAKE WATER QUALITY PREDICTIONS,
Ontario Water Resources Commission, Toronto.
B. S. Kohli, and M. D. Palmer.
Journal of Water Pollution Control Federation, Vol 44, No 8, p 1575-1580, August 1972. 1 fig, 5 tab, 8 ref.

Descriptors: *Water pollution effects, *Lakes, *Forecasting, *Regression analysis, Data collections, Water quality, Correlation analysis, Mathematical models.

Multiple regression analyses of the effects of waste water on lake water quality produced a large number of statistically significant prediction equations with similar standard errors of estimate. The equations were not sensitive to changes in the independent variables or to omission of some readings in the input data sets. Input data from several years are necessary for equation development, and multiple regression techniques for water quality estimation should be used with caution. Nevertheless, by judiciously selecting appropriate equations it is possible to estimate effects of waste water loadings on lake water chemistry. (Knapp-USGS)
W72-13060

EFFECTS OF TIDAL FLATS ON ESTUARINE WATER QUALITY,
Oregon State Univ., Corvallis.
For primary bibliographic entry see Field 05B.
W72-13063

A CRITICAL COMPARISON OF METHODS FOR MEASURING FISH RESPIRATORY MOVEMENTS,
Virginia Polytechnic Inst. and State Univ., Blacksburg.
A. G. Heath.
Water Research, Vol 6, p 1-7, 1972. 2 fig, 19 ref.

Descriptors: *Fish behavior, *Methodology, *Respiration, *Fish physiology, Measurement, Monitoring.
Identifiers: Fish respiration, Respiratory movements.

Six different methods for detecting and measuring fish respiratory movements are reviewed and compared. Several yield only breathing frequencies, which may not reflect alterations in the ambient water. The disturbance to the fish by certain methods is discussed. The method giving the most information appears to be the measurement of buccal and opercular pressures with indwelling catheters and sensitive pressure transducers. Where simplicity is important, breathing frequency may be obtained from the recording of the changing potentials between two external electrodes not actually attached to the fish. (LeGore-Washington)
W72-13095

EFFECTS OF DIELDRIN-CONTAMINATED FOOD ON THE DEVELOPMENT OF LEPTODIUS FLORIDANUS LARVAE,
Duke Univ., Durham, N.C. Dept. of Zoology.
C. E. Epifanio.
Marine Biology, Vol 13, No 4, p 292-297, April 1972. 1 fig, 5 tab, 15 ref.

Descriptors: *Pesticide toxicity, *Path of pollutants, *Crabs, *Toxicity, *Food chains, Pesticide residues, Brine shrimp, Crustacea, Aquatic animals, Pesticides, Dieldrin, Chlorinated hydrocarbon pesticides.
Identifiers: *Sublethal effects, Contaminated food, Biological magnification, Secondary toxicity, Animal development, Leptodius spp.

Leptodius floridanus (Decapoda: Xanthidae) larvae were fed dieldrin-contaminated Artemia nauplii throughout their development to megalopa. Sublethal effects were noted at dieldrin concentra-

tions as low as 5.49 mg/kg, and no larvae completed their development when fed Artemia containing 33.0 mg/kg dieldrin. Organochlorine pesticide residues were measured in zooplankton collected from Onslow Bay, North Carolina. These residue levels were much lower than those found to affect Leptodius larvae in the laboratory. (LeGore-Washington)
W72-13096

OIL POLLUTION AND WILDLIFE AND FISHERIES IN THE SANTA BARBARA CHANNEL,
University of Southern California, Los Angeles.
D. Straughan.
In: Transactions of the 36th North American Wildlife and Natural Resources Conference, March 7-10, 1971, p 219-229. 10 ref, discussion.

Descriptors: *Water pollution effects, *On-site investigations, *Oil pollution, *California, *Oil spills, *Birds, *Waterfowl, Water pollution sources, Water pollution, Oily water, Evaluation, Toxicity, Water birds, Shore birds, Gulls, Baseline studies, Fisheries, Fish, Marine fisheries, Mammals.
Identifiers: *Santa Barbara, Loons, Grebes, Cormorants, Pelicans, Marine mammals, Whales, Seals (Mammals), Porpoises, Gray whales, Pilot whales, Eschrichtium spp., Dolphins, Sea lions, Seafood.

The known biological effects of the Santa Barbara (California) oil spill of January 28, 1969 are reviewed. Areas of ignorance are noted, and difficulties in obtaining reliable baseline data are commented upon. The total loss of birds attributed to the spill was 3,686 by May 31, 1969. Loons and grebes were the most abundant dead birds, while cormorants and pelicans were the second most abundant. Populations of marine mammals were apparently not seriously affected. Similarly, no significant effect on fish was observed, although a decrease in commercial landings was caused by a decrease in local fishing effort during and immediately after the spill. No flavor taint was found in fish or invertebrates. (LeGore-Washington)
W72-13099

INFLUENCE OF KRAFT MILL EFFLUENT ON THE FLAVOR OF SALMON FLESH,
Oregon State Univ., Corvallis; Dept. of Fisheries and Wildlife.
D. L. Shumway, and G. G.Chadwick.
Water Research, Vol 5, p 997-1003, 1971. 3 fig, 1 tab, 12 ref.

Descriptors: *Taste, *Water pollution effects, *Pulp wastes, *Salmon, Organoleptic properties, Absorption, Industrial wastes, Organic wastes, Wood wastes, Pulp and paper industry, Water pollution.
Identifiers: *Seafood, *Coho salmon, Silver salmon, Taint.

In a laboratory study measurable impairment of the flavor of cooked flesh of jack coho salmon resulted from exposure of the fish to untreated kraft pulp and paper mill effluents for 72-96 hr at concentrations of about 1.0-2.0% by volume and above. No flavor impairment was noted when fish were exposed to a concentration of 2.9% by volume, the highest level tested, of biologically treated effluent. (LeGore-Washington)
W72-13100

EFFECTS OF TURBIDITY-PRODUCING SUBSTANCES IN SEA WATER ON EGGS AND LARVAE OF THREE GENERA OF BIVALVE MOLLUSKS,
Bureau of Commercial Fisheries, Milford, Conn. Biological Lab.
H. C. Davis, and H. Hidu.
The Veliger, Vol 11, No 4, p 316-323, April 1969. 7 fig, 2 tab, 6 ref.

Descriptors: *Turbidity, *Water pollution effects, *Particle size, *Oysters, Clams, *Growth stages, Aquatic environment, Silts, Clays, Shellfish, Mollusks, Embryonic growth stage, Larvae, Bioassay, Mortality, Animal growth, Animal physiology, Growth rates.
Identifiers: Fuller's earth, Silicon dioxide, Crassostrea spp., Ostrea spp., Mercenaria spp.

The effects of several concentrations of silt, clay, and Fuller's earth on embryonic development of the American oyster (Crassostrea virginica) and on survival and growth of larvae of the American oyster and the European oyster (Ostrea edulis) are reported. A series of experiments was also run to compare the effects of different-sized particles of pure silicon dioxide on embryos and larvae of hard clams Mercenaria mercenaria and American oysters, in an attempt to determine the effect of particle size of a suspended material, as opposed to possible effects of its chemical composition. (Svensson-Washington)
W72-13101

FIELD TESTING FOR WATER QUALITY CONTROL AT KRAFT PULP MILLS,
British Columbia Research Council Vancouver.
T. E. Howard, D. L. Bowen, and C. C. Walden.
Pulp and Paper Magazine of Canada, p 2-4, May 17, 1968. 4 fig, 2 ref.

Descriptors: *On-site laboratories, *On-site investigations, *Water pollution effects, Research facilities, *Laboratories, Bioassay, On-site tests, Toxicity, Pulp wastes, Evaluation, Respiration, Fish physiology, Physiological ecology, Research equipment, *Pulp wastes.
Identifiers: *Mobile laboratories, Water pollution evaluation, Median tolerance limits, Hematocrit.

A mobile laboratory is described, which, when on site at a pulp mill, permits field evaluation of the following parameters relating to toxicity of individual effluents to salmonid fish; median tolerance limits to mortality, hematocrit and respiration. Specialized equipment for measurement of buccal pressure changes, as an index of respiration, is described in detail. (LeGore-Washington)
W72-13102

SENSITIVITY OF THE WHITE AMUR TO FISH TOXICANTS,
Bureau of Sport Fisheries and Wildlife La Crosse, Wis. Fish Control Lab.
L. L. Marking.
The Progressive Fish-Culturist, Vol 34, No 1, p 26, January 1972.

Descriptors: *Pest control, *Pesticide toxicity, *Piscicides, *Chemcontrol, *Fish control agents, Pesticides, Antimycin A, Rotenone, Aquatic weeds, Eutrophication, Bioassay, Fish establishment.
Identifiers: *White amur, Ctenopharyngodon spp., Salicylanilide I, Juglone, Bayluscide, Noxfish.

Investigations are in progress to determine the suitability of the exotic white amur (Ctenopharynodon idellus) for controlling aquatic weeds. The white amur consumes huge quantities of aquatic plants, which are storehouses of plant nutrients. The removal of these nutrients in the form of protein generated by the white amur can only decrease the normal rate of eutrophication. This species could, however, become undesirable in some habitats by unwise stocking or natural reproduction. The application of direct controls against the fish might be warranted in such cases. Tests were initiated to determine the sensitivity of the white amur to several registered fish toxicants and candidate fish toxicants in laboratory bioassays. The results suggest that the white amur is approximately as sensitive as the common carp (Cyprinus carpio) to these chemicals, and chemical control of undesired populations is feasible. (Svensson-Washington)
W72-13103

A CO-OPERATIVE RESEARCH PROGRAM ON KRAFT PULP MILL EFFLUENT QUALITY,
British Columbia Research Council Vancouver.
C. C. Walden, and T. E. Howard.
Pulp and Paper Magazine of Canada, p 3-7, February 16, 1968. 7 fig, 1 tab, 5 ref.

Descriptors: *Pulp wastes, *Toxicity, *Water pollution effects, *Bleaching wastes, *Bioassay, *Lethal limit, Water pollution, Water pollution sources, Wood wastes, Industrial wastes, Sulfite liquors, Water quality, Biochemical oxygen demand, Salmonids, Growth, Fish physiology, Pathology, Adsorption, Pink salmon.
Identifiers: *Sublethal effects, *Acclimation, *Kraft effluents, Acute toxicity, Sialic acid, Mucus production, Buccal pressure, Hematocrit, Fish pathology, Kokanee, Coho salmon, Silver salmon.

The mechanics of administering a cooperative research program, supported jointly by a number of British Columbian companies, are described. Studies have accentuated the sublethal effects of kraft effluents on salmonids. Acute bioassays, used routinely for effluent evaluation, indicated a number of visual sublethal effects. Of these, condition factor (growth) of juvenile salmonids was unaffected by neutralized bleach kraft effluent (NBK). Excess mucus production was evidenced by increased sialic acid formation above 2-5% effluent levels. A sensitive technique for measuring buccal pressure has been developed to a quantitative procedure for evaluating sublethal effects on fish respiration. Hematocrit changes were evident in juvenile kokanee after 10 days exposure to 5% NBK. Some data substantiating the ability of juvenile salmonids to acclimate to sublethal levels of effluent are presented. Toxic fractions in the effluent are adsorbed on anion exchange columns. Typical biochemical oxygen demand data for a bleach kraft mill are presented. (LeGore-Washington)
W72-13106

EFFLUENT CHARACTERISTICS OF BLEACHED KRAFT PULP MILLS,
British Columbia Research Council Vancouver. Div. of Applied Biology.
T. E. Howard, and C. C. Walden.
Pulp and Paper Magazine of Canada, Vol 72, No 1, p 1-7, January 1971. 7 fig, 7 tab, 17 ref.

Descriptors: *Pulp wastes, *Water pollution sources, *Biochemical oxygen demand, *Toxicity, *Analysis, Water pollution, Bleaching wastes, Wood wastes, Industrial wastes, Sulfite liquors, Bioassay, Water pollution effects, Chemical analysis, Organic compounds, Carbon, Lethal limit, Pollutant identification, Salmonids.
Identifiers: *Total organic carbon, *Organic carbon, *Caustic extraction, Characterization, Effluent characterization.

Values are given for the toxicity, biochemical oxygen demand (BOD sub 5), and total organic carbon (TOC) from 1131 samples collected from major process streams and the combined outfall at 7 British Columbian bleached kraft mills over a 40-day period. The most toxic process stream was the first caustic extraction, followed by the unbleached white water and first chlorination effluents. Combined outfall samples were less toxic than the process streams. No ranking sequence could be established for BOD sub 5 or TOC. Interrelationships between these variables are not useful for direct prediction of one from the other. (LeGore-Washington)
W72-13108

WATER POLLUTION AND THE KRAFT PULP MILL INDUSTRY,
British Columbia Research Council Vancouver. Div. of Applied Biology.

C. C. Walden.
Western Fisheries, Vol 71, No 1, October 1965. 4 p, 21 ref.

Descriptors: *Pulp wastes, *Toxicity, *Water pollution effects, Water pollution sources, *Fisheries, Water pollution, Water pollution control, Bleaching wastes, *Industrial wastes, *Sulfite liquors, Bioassay, Water pollution treatment, Water quality, Biochemical oxygen demand, Salmonids, Lethal limit, Sulfur, Reviews.
Identifiers: Mercaptan.

Basic considerations of pulp mill waste disposal problems are reviewed. Discussion is presented on the characteristics of kraft pulp mill discharges, methods for measuring toxicity, effects of these discharges on salmonid fish, protection of fisheries, future answers to the problem, and the status of current research. (LeGore-Washington)
W72-13109

POLLUTION AND TOXICITY CHARACTERISTICS OF KRAFT PULP MILL EFFLUENTS,
British Columbia Research Council Vancouver. Div. of Applied Biology.
T. E. Howard, and C. C. Walden.
TAPPI (Technical Association of the Pulp and Paper Industry), Vol 48, No 3, p 136-141, March 1965. 6 tab, 17 ref.

Descriptors: *Pulp wastes, *Toxicity, *Water pollution effects, *Bleaching wastes, *Water pollution treatment, *Lethal limit, Water pollution, Water pollution sources, Water pollution control, Wood wastes, Hydrogen ion concentration, Industrial wastes, Wastes, Sulfite liquors, Bioassay, Water quality, Biochemical oxygen demand, Sockeye salmon, Salmonids, Resistance, Sulfur, Public health.
Identifiers: Sublethal effects, Mercaptan, Acute toxicity, Lebistes spp., Guppies, Onchorhynchus spp., Acclimation, Soluble solids, Condensate stream.

The oxygen demand, sulfide and mercaptan content, and toxicity of various individual kraft mill effluent streams have been examined. Apart from the condensate streams, toxicity of effluents is not related to sulfide or mercaptan content, and its relationship to biochemical oxygen demand (BOD) is not close. Toxicity previously ascribed to kraft effluents has been largely due to pH, and inherent toxicity is low. Bleach plant wastes constitute the largest oxygen demand source in a mill and have an appreciable absolute toxicity. Bioassays of kraft effluents examined reflected shock stress as much as inherent toxicity. Salmonid fish become acclimated to living in absnormally high concentrations of bleach plant waste. Simple storage and fermentation reduce the inherent toxicity of bleach plant wastes. Mixing kraft effluent with silty river water reduces soluble solids. (LeGore-Washington)
W72-13110

SAMPLING OF FISH MUSCLE FOR M.S. 222 AND QUINALDINE RESIDUES,
Bureau of Sport Fisheries and Wildlife Warm Springs, Ga. Southeastern Fish Control Lab.
For primary bibliographic entry see Field 05A.
W72-13111

THE INFLUENCE OF DE-FREEZING LIQUID AND OF CERTAIN AROMATIC SUBSTANCES ON LOWER AQUATIC ANIMALS AND ON FISH, (IN CZECH),
Vyzkumny Ustav Rybarsky a Hydrobiologicky Vodnany, Prague (Czechoslovakia).
J. Havelka, and O. Albertova.
Zivocisna Vyroba, Vol 13, p 519-526, 1968. 2 tab, 6 ref. English summary.

Descriptors: *Aromatic compounds, *Toxicity, *Fishkill, *Bioassay, Organic compounds, Lethal limit, Mortality, Daphnia, Carp, Tubificids, Waste water (Pollution), Sampling.
Identifiers: *Ethylene glycol, *Isooctanol, *Styrene, Sublethal effects, Monoethylene glycol, Diethylene glycol, Triethylene glycol, Lebistes spp., Guppies, Tubifex spp.

Attention is drawn to the difficulty of accurately determining the kinds of aromatic substances causing mass fish mortalities and of determining the toxicity of aromatic substances contained in waste waters. Related to the volatility of aromatic substances, this difficult situation is undoubtedly influenced by the timeliness and technical competence in sampling the water and in gathering peripheral data. A substantial deficiency in the complex estimation of the harmfulness of aromatic substances in natural waters--in fact, all harmful substances in waste waters--is the fact that data on the physical properties of the water involved are often inadequate. In practice, the determination of the effluent which is the carrier of the acute values of aromatic substances is, with regard to the volatility of its toxic substances, especially difficult. In this study, the harmful values of examined substances have been determined and summarized. These are purely informative values that must be, in practice, evaluated within the scope of overall conditions in the natural environment. (LeGore-Washington)
W72-13112

EFFECTS OF THE WATER-SOLUBLE COMPONENT OF OIL POLLUTION ON CHEMORECEPTION BY CRABS,
City of Hope National Medical Center, Duarte, Calif.
J. S. Kittredge.
Available from the National Technical Information Service as AD-738 505, $3.00 in paper copy, $0.95 in microfiche. 1971. 5 p, 4 ref. ONR N00014-71-C-0103 NSF GB-27703.

Descriptors: *Crabs, *Animal physiology, *Oil pollution, *Water pollution effects, Absorption, Animal behavior, Water pollution, Oil spills, Oily water, Bioassay, Water chemistry, Inhibition, Marine animals, Marine biology.
Identifiers: *Crude oil toxicity, *Chemoreception, *Pheromones, *Oil spill effects, *Sex pheromone, Lined shore crab, Pachygrapsus spp., Feeding response, Sisquoc sand crude oil, California crude oil.

The minor water soluble component of crude oil is potentially the most dangerous fraction to marine life. The feeding response and sex pheromone response of the lined shore crab, Pachygrapsus crassipes, were used to assay the possibility that chemoreception is particularly susceptible to the water soluble component of crude oil. Very dilute solutions of the water soluble extracts of two crude oils tested completely inhibited both the feeding response and the response to the sex pheromone. The recovery period for ten crabs tested varied from three to six days. (Svensson-Washington)
W72-13113

A REVIEW OF AUTECOLOGICAL AND SAPROBIOLOGICAL DATA ON FRESHWATER CILIATES, (EINE ZUSAMMENSTELLUNG VON AUTOKOLOGISCHEN UND SAPROBIOLOGISCHEN BEFUNDEN AN SUSSWASSERCILIATEN),
Bonn Univ. (West Germany). Zoological Inst.
H. Bick, and S. Kunze.
Internationale Revue der Gesamten Hydrobiologie, Vol 56, No 3, p 337-384, 1971. 1 tab, 142 ref.

Descriptors: *Protozoa, *Biological properties, *Systematics, Bacteria, Salinity, Aquatic animals, Ammonia, Carbon dioxide, Hydrogen sulfide, Dissolved oxygen, Acidity, Bioindicators, Water temperature, Aquatic microorganisms, Biochemical oxygen demand, Hydrogen ion concentration, Resistance, Nutrient requirements.
Identifiers: *Ecological valencies, *Saprobiological valencies, Substrate utilization, Blepharisma lateritium, Acineria incurvata, Amphileptus spp., Askenasia volvox, Aspidisca spp., Aspidisca turrita, Brachonella spiralis, Bursaria truncatella, Bursellopsis spumosa, Carchesium polypinum, Chaetospira mulleri, Chaetospira remex, Chilodonella spp.

Ecological data for 132 species of ciliated protozoans are summarized in tabular form. The data concern ecological valencies (limits of tolerance) in relation to temperature, pH, O2 (D.O.), percentage of oxygen saturation, BOD5, free CO2, NH4, free NH3, H2S, salinity and number of bacteria. The saprobiological valencies of 72 ciliates are also provided. (Snyder-Battelle)
W72-13144

LOCALIZATION OF FISH-LICE AND LEECHES IN CARPS DURING THE AUTUMN FISHING,
Vysoka Skola Veterinarni, Brno (Czechoslovakia).
For primary bibliographic entry see Field 02H.
W72-13155

A STATISTICAL ANALYSIS OF THE MERCURY CONTENT OF FRESH WATER FISH IN NEW YORK STATE,
New York State Dept. of Environmental Conservation, Albany. Environmental Quality Research and Development Unit.
P. Boulton, and L. J. Hetling.
February 1972. 16 p, 3 fig, 5 tab.

Descriptors: *Mercury, *Fish, *New York, *Water pollution effects, *Industrial wastes, *Analytical techniques, Water quality, Pollutant identification, Toxins, Heavy metals, Freshwater fish.
Identifiers: *Mercury concentration.

Because of the concern for mercury concentrations in the fish in New York State, chemical analyses were made of the mercury concentrations in more than 3200 fish from 142 locations. The average mercury level for all fish was 0.44 ppm and the highest level found was 8.20 ppm in fish from Onondaga Lake. Excluding the findings for Onondaga Lake, the maximum concentration found was 3.40 ppm. Field personnel were instructed to wrap each fish in a separate plastic bag and freeze immediately. The frozen samples were collected at the Rome, New York Department of Environmental Conservation's Fish Pathology Laboratory and then sent to the Department of Health's Laboratory in Albany where they were stored in large freezers until the analyses were made. Fish muscle tissue excluding bone was processed for mercury analysis. The wet sample was digested in a mixture of sulfuric acid and hydrogen peroxide. Hydroxylamine HCl-NaCl solution and stannous chloride solution were then added simultaneously to the digestate to reduce the mercury to the ground state prior to analysis by atomic absorption spectroscopy on a Techtron Model A.A. 4 atomic absorption spectrophotometer. The absorbance of the mercury was recorded by a Sargent-Welch Model SRLG recorder. The value of the mercury in the fish was determined by comparison with a standard mercury solution. The data printouts and statistical analyses were done utilizing an IBM 360/50 computer and two programs from the University of California biomedical computer program package. (Poertner)
W72-13163

MERCURY POLLUTION INVESTIGATION IN GEORGIA, 1970-1971.
Georgia Water Quality Control Board, Atlanta.

1971. 117 P, 2 FIG, 9 TAB.

Descriptors: *Mercury, *Georgia, *Fish, *Analytical techniques, *Water pollution effects, Water quality, Industrial wastes, Pollutant identification, Toxins, Heavy metals, Freshwater fish.
Identifiers: *Mercury concentration.

Mercury concentrations were determined in fish, crabs, shrimp and shellfish in Georgia. In regions of high mercury concentrations in the biota, mud samples were also analyzed. Excessive mercury concentrations (above 0.5 microgram/gram) were found in two regions, both regions having received waste discharges from mercury-cell-type chlor-alkali plants. The areas of concern in Georgia are the Savannah River between the cities of Augusta and Savannah and the Brunswick and Turtle Rivers upstream from U. S. Highway 17 at Brunswick, Georgia. Regions not having a history of receiving wastes from mercury-cell-type chlor-alkali plants did not provide a cause for concern of mercury contamination. Areas surveyed included seven major river basins and the Georgia estuaries from Savannah Harbor to Cumberland Sound. Following notification by the State Water Quality Control Board, the chloralkali plants in Augusta and Brunswick reduced their mercury discharges to levels below 0.25 lbs. per day. Effluent monitoring is now a part of their operating procedures. An effective program to control mercury discharge must be maintained consistently to protect the State's waters and provide for the purposes for which they are classified. (Poertner)
W72-13170

TOXICITY OF COMBINED CHLORINE RESIDUALS TO FRESHWATER FISH,
Michigan Dept. of Natural Resources, Lansing. Water Resources Commission.
J. A. Zillich.
Journal of the Water Pollution Control Federation, Vol 44, No 2, p 212-220, February 1972. 1 fig, 5 tab, 9 ref.

Descriptors: *Chlorine, Water pollution sources, *Water quality, *Toxicity, *Water chemistry, *Freshwater fish, Chlorination, Water purification, Water quality control, Water treatment, Sewage treatment, Chemical reactions, Bioassay, Hydrogen ion concentration, Dissolved oxygen, Water temperature, Water analysis, Conductivity, Nickel, Copper, Chromium, Zinc, Effluents, Waste water (Pollution), Fish physiology, Minnows, Sodium compounds, Sunfishes, Bullheads, Ammonia, Ammonium compounds.
Identifiers: *Chlorine residuals, *Chloramines, *Pimephales spp., Cyanide, Fathead minnows, Sublethal effects, Avoidance, Sodium thiosulfate, Detoxification, Hypochlorites.

A considerable amount of study of the use of chlorine to disinfect wastewater, lower its biochemical oxygen demand, and retard the degradation of receiving streams has been completed. However, very little has been done to determine the effect of chlorine on fish in these streams. Chlorine combines with a number of materials, especially ammonia, to form very toxic compounds. Recent studies conducted by the Michigan Water Resources Commission and other work on the toxicity of such residual chlorine are discussed. (Svensson-Washington)
W72-13174

EFFECTS OF CHEMICAL WASTES ON MARINE ORGANISMS,
Queen Mary Coll., London (England). Dept. of Zoology and Comparative Physiology.
R. C. Newell, and B. Brown.
Marine Technology, Vol 2, No 5, p 217-223, 1971. 6 fig, 3 tab, 18 ref.

Descriptors: *Water pollution effects, *Aquatic life, *Food chains, *Chemical wastes, *Public health, *Path of pollutants, Water pollution, Water pollution sources, Absorption, Aquatic environment, Food webs, Balance of nature, Productivity, Heavy metals, Pesticide residues, Phenols, Pesticides, Insecticides, Toxicity, Copper, Zinc, Cadmium, Chromium, Iron, Manganese, Nickel. Lead, DDT, DDE, Pesticide toxicity, Polychlorinated biphenyls, Marine animals, Marine plants, Reviews.
Identifiers: *Biological magnification, *Sublethal effects, Biological concentration, Marine organisms.

The accumulation and effects of toxic substances in marine organisms are discussed in this review. Toxic compounds considered include salts of heavy metals such as lead, mercury, zinc and copper; polychlorinated biphenyls; phenols; and chlorinated hydrocarbon pesticides such as DDT and DDE. It is concluded that if animals high in the marine food chains are to be used as a major source of food for man, it will be necessary to adopt stringent measures to prevent the discharge of apparently lethal amounts of persistent toxins into the sea. (Svensson-Washington)
W72-13175

CHEMICAL INHIBITION OF SPERM-EGG INTERACTION IN THE SEA URCHIN,
Albion Coll., Mich. Dept. of Chemistry; and Albion Coll., Mich. Dept. of Biology.
R. J. Flaherty, and R. D. Mortensen.
Bios, Vol 42, No 1, p 10-16, March 1971. 4 tab, 16 ref.

Descriptors: *Inhibitors, *Animals physiology, *Enzymes, Heavy metals, Copper, Iron, Zinc, Flourine, Biochemistry, Sea water, Water pollution effects.
Identifiers: *Sea urchin eggs, *Sea water chemistry, Sea urchins, Strongylocentrotus spp., Hyaluronidase.

The effect of various agents on activation of eggs in the sea urchin, Strongyolocentrotus purpuratus, has been studied; Cu (2+), Fe (3+), Fe (2+), Zn (2+), and F (-) are effective inhibitors of what is probably the hyaluronidase-hyaluronic acid system. Analysis suggests that the enzyme or enzymes may have two different sites where the inhibition occurs: one site where cation-S complexes are formed and perhaps distort the enzyme molecule, and the other site, perhaps the active site, where an H bond-ionic-size effect results in competitive inhibition. Results indicate that all of the major components of seawater are necessary for normal activation. Ca (2+) and HCO3 (-) are particularly important. (Svensson-Washington)
W72-13176

A SMALL BIOASSAY LABORATORY DESIGNED FOR EXPERIMENTAL THERMAL EFFECTS EVALUATION,
Washington Univ., Seattle. Coll. of Fisheries.
For primary bibliographic entry see Field 05A.
W72-13177

EXPERIMENTAL DRIFTS OF JUVENILE SALMONIDS THROUGH EFFLUENT DISCHARGES AT HANFORD, PART II. 1969 DRIFTS AND CONCLUSIONS,
Batelle-Pacific Northwest Labs., Richland, Wash.
C. D. Becker, C. C. Coutant, and E. F. Prentice.
Available from the National Technical Information Service as BNWL-1527, $3.00 in paper copy, $0.95 in microfiche. Atomic Energy Commission Research and Development Report BNWL-1527, UC-48, January 1971. 61 p, 16 fig, 8 tab, 22 ref. AEC AT (45-1)-1830.

Descriptors: *Thermal pollution, *Heated water, *Water pollution effects, *Salmonids, *Columbia River, Water pollution, Nuclear powerplants, Water temperature, Water pollution sources, Toxicity, Chinook salmon, Bioassay, Rainbow trout, Fish barriers, Fish migration, Fish populations, Fishkill, Juvenile fish, Discharge (Water), Mortality.
Identifiers: *Thermal shock, Coho salmon, Silver salmon, Steelhead, Salmo spp., Oncorhynchus spp., Thermal mixing, Liveboxes.

Field investigations were conducted from March to September, 1968 and 1969 to determine the effect of heated reactor effluents on juvenile salmonids passing through the central Columbia River. The fundamental approach was to drift groups of fish held in liveboxes through areas representing maximum thermal increments while monitoring exposure temperatures and subsequently comparing survival or mortality among test and control groups. Shoreline drifts resulted in significant mortalities among only a few test groups whereas midriver drifts resulted in losses only under unfavorable late summer conditions. The most important environmental features regulating thermal dose were river temperature and river discharges, which ranged from about 2.0 to 20C and 40,000 to 280,000 cf/sec, respectively, throughout the year. The greatest potential for thermal damage exists from mid-July to August when river temperatures peak near 20C and discharges drop below 100,000 cf/sec. Most chinook migrants produced in the Hanford area have departed seward by this time. However, the migration timing of juvenile salmonids from above Hanford is retarded by the reservoir complex until July and August when river conditions are more hazardous. Nevertheless, the disproportionate ratio of effluent volume to total water mass and the rapid decline of plume temperatures after discharge tend to minimize the actual proportion of migrating juveniles that are exposed to sublethal and lethal thermal shock. (Svensson-Washington)
W72-13178

THE EFFECTS OF SELECTED FUNGICIDES AND SOIL FUMIGANTS UPON THE MICROFUNGI OF A CATTAIL MARSH,
Wisconsin Univ., Madison. Water Resources Center.
L. L. Tews.
Proceedings, 14th Conference on Great Lakes Research, 1971, p 128-136. 8 tab, 6 ref. OWRR A-025-WIS (3).

Descriptors: *Microfungi, *Pesticides, *Eutrophication, *Phytoplankton, Marshes, *Wisconsin.
Identifiers: Captan, Vapam, Vorlex, Dexon, Dithane, Terraclor, Thiram, Zineb, Soil fumigants.

Six commonly used fungicides (Captan, Dexon, Dithane, Terraclor, Thiram and Zineb) are two commonly used soil fumigants (Vapam and Vorlex) were applied to cultures of the predominant microfungi of a cattail marsh, i.e., to Hansenula saturnus (Klocker) H. and P. Sydow, Mucor hiemalis Wehmer, Penicillium stipitatum Thom and Trichoderma viride Pers. ex Fr. Captan, Vapam and Vorlex inhibited the growth of all four fungi at field concentrations. Captan, Terraclor, Thiram, Vapam and Vorlex were the most inhibitory to the growth of T. Viride in culture and subsequently applied to plots in a cattail marsh. In the field study, only Vapam and Vorlex significantly reduce the number of microfungal propagules in the litter, water and mud. The results of the three fungicide studies were inconclusive.
W72-13180

SURFACE SEDIMENTS IN LAKE TAHOE, CALIFORNIA-NEVADA,
California Univ., Davis. Inst. of Ecology; and California Univ., Davis. Dept. of Zoology.
For primary bibliographic entry see Field 02J.
W72-13196

RADIOLOGICAL SURVEYS OF PEARL HARBOR, HAWAII, AND ENVIRONS, 1966-1968,
Eastern Environmental Radiation Lab., Montgomery, Ala.
For primary bibliographic entry see Field 05B.
W72-13271

AN OUTBREAK OF INFECTIOUS HEPATITIS IN VILLAGE PUNDI IN SANGLI DISTRICT: AN EPIDEMIOLOGICAL REPORT,
Miraj Medical Coll. (India).
M. G. Nadkarni, and B. G. Sahastrabudhe.
Indian J Med Res. Vol 59, No 7, p 1163-1171. 1971. Illus.
Identifiers: *Public health, *Water pollution effects, Epidemiology, Flies, Genetics, Hepatitis, India, Pundi (India), Resistance, Sangli (India).

An outbreak of infectious hepatitis affecting 6.6% of the population of 1233, in a small rural community consuming well water is described. Insanitary wells and fly nuisance have played a role in transmission. The observation that Mahars and Mangs are not affected leaves ground for further study of genetic resistance of this community to infectious hepatitis. Attack rates in relation to age and sex are discussed.--Copyright 1972, Biological Abstracts, Inc.
W72-13276

CONTROL OF WATER MILFOIL IN WISCONSIN,
Wisconsin Univ. Center, Marinette.
T. W. Thompson.
Paper presented at National Meeting of the Weed Science Society of America, St Louis, Missouri, February 8-9, 1972. 11 p, 13 ref. OWRR B-046-WIS (7).

Descriptors: *Wisconsin, *Aquatic weed control, Harvesting, Chemcontrol, Biocontrol, Sediments, Lakes, Aquatic plants, Social aspects, Water quality, Herbicides, Economics, Tourism, Water pollution control, Eutrophication, Recreation, Costs, Governmental interrelations.
Identifiers: *Mechanical harvesting, *Water milfoil, Lake Noquebay (Wis), Silvex.

Myriophyllum spicatum in southern and M heterophyllum in northeastern Wisconsin are offensive nuisances. They thrive on muck bottoms in three to twelve feet of water and may crowd out more desirable aquatic plants. In Dane and Marinette Counties mechanical harvesting offers the most attractive means of controlling these aquatic weed growths. Biological control lacks tested natural enemies of water milfoil in northern areas and there is a beneficial effect of the root systems in stabilizing loose sediments. Winter drawdown offers little hope of controlling Myriophyllum, which reaches maximum densities in water four to six feet and extends at least 15 feet. Chemical control adversely affects water quality, clarity, and dissolved oxygen by failing to remove biomass. Aquatic herbicides not target specific imperil the food chain upon which fish depend and eliminate desirable as well as problem plants. Economic attractiveness of chemical control appears deceptive considering large areas to be treated and ineffectiveness of some herbicides in controlling M heterophyllum. Mechanical harvesting is target specific, removes problem biomass, leaves root systems intact and can improve fishing. On a long term basis only enlightened shoreland management can solve the milfoil problem in Wisconsin. (Jones-Wisconsin)
W72-13291

GROWTH AND MINERAL ACCUMULATION OF SUBMERSED VASCULAR HYDROPHYTES IN PLEIOEUTROPHIC ENVIRONS,
Michigan State Univ., East Lansing. Inst. of Water Research.
C. D. McNabb, Jr., and D. P. Tierney.
Available from the National Technical Information Service as PB-211 609, $3.00 in paper copy, $0.95 in microfiche. Michigan Institute of Water Research, East Lansing, Completion Report, May 1972. 33 p, 6 fig, 2 tab, 4 ref. OWRR A-031-MICH (1).

Descriptors: Ponds, Environments, Nitrogen, Phosphorus, *Eutrophication, Aquatic plants, Nutrient requirements.
Identifiers: Waste water ponds, *Pleioeutrophic waste water ponds, Ambient water concentration, *Submersed vascular hydrophytes, Transplanted and indigenous populations, *Ceratophyllum demersum, Egeria densa, Eledea nuttallii, Lagarosiphon major.

Ceratophyllum demersum, Egeria densa, Elodea nuttallii and Lagarosiphon major have been studied in pond environments. A maximum net yield near 700 gm/m2 ash-free dry weight can be expected from the best adapted of these growing for 60-70 days in pleioeutrophic wastewater ponds. Luxury consumption of nitrogen and phosphorus occurred in transplanted and indigenous populations. Ceratophyllum demersum had 5.34% nitrogen by ash-free dry weight across a mean seasonal ambient water range of 0.52 to 13.38 mg/L of inorganic-N. A significant regression of mean seasonal tissue percentage on mean seasonal ambient water concentration for C. demersum in regard to soluble phosphorus (as P) was $y = 0.62 + 0.29 x$ plus or minus 0.06 where $r = 0.84$. The ambient range was 0.10 to 3.28 mg/L. C. demursum was not a special case in regard to these relationships. Cr, Ni, Co, Cu, Zn and Pb in submersed vascular hydrophytes appear to be related to the amount of the elements in the environment.
W72-13294

VARIATION IN DIATOM MORPHOLOGY AND WATER POLLUTION,
Connecticut Univ., Storrs. Inst. of Water Resources.
F. R. Trainor.
Technical Completion Report, June 1972. 4 p, 3 ref. OWRR A-014-CONN (4).

Descriptors: *Diatoms, Freshwater, Brackish water, *Salinity, *Sodium, Bioindicators, Life cycles, *Environmental effects, Reproduction.
Identifiers: *Cyclotella meneghiniana, *Cyclotella cryptica, *Polymorphism, *Induced sexual phase, Culture studies, Species concept.

Morphological responses of fresh- and brackish-water diatoms to changes in the physical and chemical environment were studied using culture technique. Findings show the wall morphology of the diatom species studied were not stable in different environments throughout the organism's life cycle, an assumption upon which identification of these organisms is based. The brackish-water diatom 'Cyclotella cryptica' was capable of producing the wall pattern characteristic of another species, 'C. meneghiniana,' in freshwater or in very low salinity. Results show also that speciation is not always precisely correlated with wall characteristics as assumed. Four distinct biological entities (species) were found capable of producing the wall pattern characteristic of 'Cyclotella meneghiniana.' Information concerning the process of sexual reproduction in the diatoms studied was obtained also. The sexual process of 'C. meneghiniana,' a common centric diatom which occupies habitats from fresh- to brackish-water, is correlated with the concentration of sodium salts in the medium. It can be induced in culture by Na+ stress. The sexual phase in 'C. cryptica' and several other diatom species, on the other hand, was correlated with a change in total salinity rather than in a single ion.
W72-13297

A PILOT PROGRAM TO DETERMINE THE EFFECT OF SELECTED NUTRIENTS (DISSOLVED ORGANICS, PHOSPHORUS, AND NITROGEN) ON NUISANCE ALGAL GROWTH IN AMERICAN FALLS RESERVOIR,
Idaho Univ., Moscow. Water Resources Research Inst.
F. L. Rose, and G. W. Minshall.
Available from the National Technical Information Service as PB-211 612, $3.00 in paper copy, $0.95 in microfiche. Moscow, Completion Report, June 1972, 37 p, 15 fig, 5 tab, 9 ref, append. OWRR A-039IDA (1).

Descriptors: *Algal control, *Phosphorus, *Nitrogen, *Idaho, *Chlorophyll, *Anabaena, Nutrients, Dissolved solids, Phytoplankon, Water pollution effects.
Identifiers: *Glucose, *Snake River (Idaho), *Dissolved organic carbon, *American Falls Reservoir, *Aphanizomenon, Algal growth.

A field investigation was conducted to determine the feasibility of using polyethylene tubes as in situ culture chambers in assessing the influence of selected nutrient factors on algal growth. The study was carried out in American Falls Reservoir, a large multipurpose impoundment on the Snake River in S.E. Idaho, during the summer of 1971. The tubes contained added amounts of phosphorus or phosphorus and organic carbon (glucose) and were subsequently 'seeded' with naturally occurring algal species. Periodic water samples taken from the tubes were analyzed for total and soluble phosphorus, total and soluble orthophosphorus, ammonium-N, nitrite-N, nitrate-N, particulate and dissolved organic carbon, total dissolved solids, chlorophyll a, and abundance of major phytoplankton species. Results were compared with those from ambient water collected both at the location of the experimental work and at other sites in the reservoir. Growth of planktonic organisms, especially Aphanizomenon and Anabaena, reached levels 10 times more numerous in the experimental tubes than in the ambient water. Although modification of some parts of the technique are suggested the use of polyethylene tubes appears to be of considerable promise in future investigations.
W72-13300

PHASES I AND II: EFFECTS OF PULP AND PAPER MILL EFFLUENTS ON GROWTH AND PRODUCTION OF FISH,
Oregon State Univ., Corvallis. Dept. of Fisheries and Wildlife.
C. E. Warren.

Descriptors: *Pulp wastes, *Chinook salmon, *Biochemical oxygen demand, *Salmonids, *Waste dilution, Amphipoda, Snails, Waste, Water (Pollution), *Effluents, Toxicity.

In aquarium studies, concentrations of 0.5 mg/l BOD (0.25 percent by volume) and greater of primary treated kraft effluent were found to decrease the growth rate of chinook salmon fed on tubificid worms. Neutralized bleached kraft effluent at concentrations as high as 3 percent by volume (about 4 mg/l BOD) did not adversely affect salmon growth rate. Salmon exposed to a 6 percent concentration, however, did exhibit important reductions in growth rate. Biologically stabilized effluent from mill A remained more toxic to fish than stabilized effluent. Production of chinook salmon was reduced during spring in laboratory streams receiving primary treated effluent at 1.5 percent by volume (3 mg/l BOD) but not in streams receiving 0.5 percent by volume (1 mg/l BOD). During summer experiments, primary treated and stabilized kraft effluent appeared to be less toxic. In laboratory stream experiments conducted during the spring, winter and fall, stabilized effluent reduced salmon production at a concentration of 1.5 percent by volume (0.5 mg/l BOD and lower). No difference in diversity of the insect

community could be attributed to the 0.5 mg/l level of either primary treated or biologically stabilized kraft mill effluent.
W72-13305

WARM WATER DISCHARGES INTO RIVERS AND THE SEA,
Central Electricity Generating Board, London (England).
F. F. Ross.
Water Pollution Control, Vol 70, No 3, p 269-274, 1971. 4 ref.

Descriptors: *Cooling water, *Nuclear powerplants, *Thermal pollution, *Heated water, Fish conservation, Fish farming, Insects, Plankton, Sewage effluents, Clams, Cooling towers, Water reuse.
Identifiers: Croydon (Britain).

The progress report examines some of the ecological fears associated with nuclear power plants and alternatives to using natural waters for thermal discharge and cooling. Fear of plankton death resulting from a trip through the cooling system appears to be unfounded. Adverse effects of thermal discharges on insect hatching are said to be non-existant. Heated discharges are not viewed as being harmful to fish or bottom-dwelling animals unless the heated water is mixed with the receiving water. Reduced dissolved oxygen due to thermal discharges is not seen as a problem because most water bodies used by nuclear plants are not saturated with oxygen and the 'oxygen sag curve' does not take rapidity of heat loss into account. Power plants located in lakes should, however, draw cooling water from the lake bottom to prevent disruption of overturn cycles. The use of thermal discharges in growing clams, plaice, soles and prawns is favorably discussed. The use of sewage effluent for cooling at Croydon is detailed and favorable results are reported. Extensive use of cooling towers is made in Britain. Despite problems with mineral salt buildup, the towers are said to be effective water purifiers. (Bass-Vanderbilt)
W72-13319

THE EFFECT OF RESIDUAL CELLULOSE WATERS ON AQUATIC INVERTEBRATES,
Institutul de Medicina si Farmacia, Iasi (Rumania). Catedra de Igiena.
S. Apostol.
Stud Cercet Biol Ser Zool, Vol 23, No 4, p 349-357, 1971, Illus, English summary.
Identifiers: *Water pollution effects, *Industrial wastes, Aquatic animals, Cellulose, Daphnia magna, Invertebrates, Paramecium caudatum.

The noxious action of cellulose plant wastes was determined in acute and chronic bioassays on Paramecium caudatum and Daphnia magna. A chronic action of these pollutants was recorded affecting especially the reproduction process. It is necessary that the dilution of effluents in the stream waters be of 1/100,000 (even much greater), so that the autopurification process is not disturbed.--Copyright 1972, Biological Abstracts, Inc.
W72-13333

PHYTOPLANKTON PRODUCTION AND THE DISTRIBUTION OF NUTRIENTS IN A SHALLOW UNSTRATIFIED ESTUARINE SYSTEM NEAR BEAUFORT, N.C.,
National Marine Fisheries Service, Beaufort, N.C. Center for Estuarine and Menhaden Research.
G. W. Thayer.
Chesapeake Sci, Vol 12, No 4, p 240-253, 1971, Illus.
Identifiers: *Phytoplankton, *Beaufort (NC), Distribution, *Estuarine environment, *North Carolina, Nutrients, Photosynthesis, Production, Estuaries.

Photosynthesis, nutrients, and phytoplankton standing crop were measured for 1 yr at 32 stations in a system of shallow estuaries near Beaufort, N. C. Photosynthesis and chlorophyll had pronounced and similar seasonal distributions which roughly followed the cycle in water temperature. Production was generally minimal during Dec. and maximal during June and July. Annual production at individual stations ranged from 16 g C/m2 to 153 g C/m2, and averaged 66.6 g C/m2 for the 400 km2 system. Phosphate concentrations were generally low throughout the year, ranging from of 0.00-1.46 micro gA/l. Nitrate values ranged from 0.00-2.65 micro gA/l, and ammonia from 0.00-4.30 micro gA/l. Maximum available N and phosphate concentrations slightly preceded the period of maximum photosynthesis. N and P were both probably limiting to phytoplankton in this system, but N:P ratios suggest that N was the more limiting.--Copyright 1972, Biological Abstracts, Inc.
W72-13337

CHANGES IN THE PHYTOPLANKTON OF THE DEVELOPING VOLTA LAKE,
Volta Lake Research Project, Akosombo (Ghana).
S. Biswas.
Ghana J Sci. Vol 10, No 2, p 85-92. 1970. Illus.
Identifiers: Cyanophyta, Diatoms, Flagellates, Ghana, *Lakes, *Phytoplankton, *Volta Lake.

The phytoplankton of the developing Volta Lake consisted of more than twice the number of taxa found in the river system before the impoundment. Such an increase in taxonomic diversity was not uniform in all the classes as the green algae increased 4 times, the euglenoids 8 times and the blue-green algae more than twice. The flagellates barely increased while the diatoms decreased due to the disappearance of some of the taxa common in the tributaries. There was a greater abundance of phytoplankton in the lower reaches than in the upper ones. In general, classes of algae represented by a few taxa showed a high density of population. This was especially the case with the diatoms in the lower reaches and occasionally the flagellates in all parts of the lake. In the river the phytoplankton varied from a near absence to a high peak of short duration before the flood. Such extreme variations were not observed in the lake. The peak initially showed no definite seasonal pattern but later it settled to the dry season following the flood. In the lower reaches of the lake the dominant organisms changed from the blue-green algae to the diatoms and then again to the former. Quantitatively, however, there has been a considerable decline of blue-green algae. Most of the organisms occurred vegetatively in all parts of the lake throughout the year. They were present in the upper layers during the months of stratification. Periodic mixing distributed them throughout the depth, especially during the months of floods and wind-action.--Copyright 1972, Biological Abstracts, Inc.
W72-13339

COMPARISON OF MERCURY LEVELS IN AN OLIGOTROPHIC AND A EUTROPHIC LAKE,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
F. M. D'Itri, C. S. Annett, and A. W. Fast.
Mar Technol Soc J., Vol 5, No 6, p 10-14. 1971. Illus.
Identifiers: Airborne pollution, Eutrophication, Fallout, Hazards, *Lakes, *Mercury, Michigan, Oligotrophy, Water pollution, Rainbow trout, Water pollution sources.

The overall Hg burden of rainbow trout in 2 lakes was studied. The removal of Hg by adsorption onto organic particulate matter probably is a key factor in the different Hg levels of fish in the 2 lakes. This adsorption mechanism makes the Hg from pollution less available for accumulation by the fish that feed in the water column. Therefore, the persistence of Hg compounds in these 2 isolated lakes appears to be related to the organic character of each lake. Accordingly, Hg pollution appears to pose a greater environmental hazard in oligotrophic than in eutrophic lakes. And the same is true for the persistence of chlorinated hydrocarbon pesticides (Hamelink, et al., 1971; Terriere, et al., 1966). Since Section Four and Hemlock Lakes have no direct point discharge sources of Hg, the cause of their Hg pollution is unknown. Their location in a remote, undeveloped natural area of Michigan is 45 m downwind from cement manufacturing plants and fossil fuel burning communities. One causal theory, then, is that the airborne fallout of Hg may account for a substantial portion of the Hg loading to these lakes.--Cpyright 1972, Biological Abstracts, Inc.
W72-13340

HETEROTROPHIC MICROFLORA OF AMU DARYA RESERVOIRS AND ITS ROLE IN MINERALIZATION OF ORGANIC MATTER,
Akademiya Nauk Kazakhskoi SSR, Alma-Ata. Inst. of Microbiology and Virology.
N. S. Sagidullaev, and M. I. Novozhilova.
Mikrobiologiya. Vol 40, No 4, p 714-717. 1971. English Summary.
Identifiers: *Microorganisms, Achromobacter liquefaciens, Achromobacter nitrificans, Achrombacter thalassium, Bacillus albus, Mineralization, *Organic matter, Reservoirs, USSR, Amu Parya.

The specific composition of heterotrophic bacteria was studied for the first time in reservoirs of the lower reaches of Amu Darya delta. Various species of heterotrophic microflora were detected in the reservoirs: 125 strains of water bacteria belonged to 12 genera and 64 spp. Non-sporeforming microorganisms prevailed (89.1%), especially rod-like forms. The following species were widely distributed: Bacillus albus album Copeland (1899), Achromobacter nitrificans Chester (1901), A. liquefaciens Jordan (1890), A. thalassium Zo Bell et Upham (1944). Among the identified species 58.3% microorganisms expressed proteolytic activity, 30%-ammonifying activity and 64%-denitrifying activity. Therefore, heterotrophic microorganisms are involved in the total turnover of organic matter in the reservoirs of Karakalpakia.--Copyright 1972, Biological Abstracts, Inc.
W72-13341

THE EFFECT OF OIL SLICK DISPERSANT, ESSO COREXIT 7664 AND THE JOINT EFFECT WITH CRUDE OIL ON THE SURVIVAL OF MARINE GLASS FISH, AMBASSIS SP. AND PALAEMONID SHRIMPS
Ministry of Agriculture and Lands, Kuala Lumpur (Malaysia). Fisheries Div.
S. A. Latiff.
Malysian Agricultural Journal, Vol 48, No 1, p 13-19, 1971. 4 fig, 2 tab, 5 ref.

Descriptors: *Oil pollution, *Bioassay, *Toxicity, *Water pollution effects, Oily water, Oil spills, Emulsifiers, Shrimp, Aquatic animals.
Identifiers: *Oil dispersants, *Corexit, *Glass fish, *Palaemonid shrimp, Crude oil, Dispersants, Oil slicks, Ambassis spp.

The median tolerance limit for 24 hr for the glass fish was 1.04 ml corexit/l of sea water without crude oil, and 1.07 ml/l with crude oil. The corresponding figures for palaemonid shrimps appeared to be 2.08 and 1.68 ml/l, respectively. Threshold toxicity for the glass fish was raised from 0.12 ml to 0.51 ml/l after the addition of crude oil; for the shrips there was only a slight rrise from 0.12 to 0.21 ml/l. Percentage survival of test animals is inversely proportional to the concentration of ESSO Corexit, but on the addition of crude oil it shows a negative exponential relationship with concentration. For the glass fish, the joint effect of Corexit 7664 and crude oil considered as a whole proves to be less toxic than the lone effect of the dispersant at lower concentrations and more

toxic at higher concentrations. For palaemonid shrimps, toxicity of Corexit is reinforced at higher and lower concentrations. Finally, Corexit is much less toxic than the other emulsifiers tested. (Svensson-Washington)
W72-13343

SOME EFFECTS OF LOW OXYGEN TENSIONS ON THE DISTRIBUTION OF THE THREE--SPINED STICKLEBACK GASTEROSTEUS ACULEATUS L. AND THE NINE-SPINED STICKLEBACK PUNGITIUS PUNGITIUS (L.),
Hull Univ. (England).
D. B. Lewis, M. Walkey, and J. G. Dartnall.
Journal of Fish Biology, Vol 4, p 103-108, 1972. 2 fig, 1 tab, 15 ref.

Descriptors: *Oxygen requirements, *Fish physiology, *Sticklebacks, *Gasterosteus species, *Pungitius species, *Distribution, *Aquatic environment, Oxygen, Dissolved oxygen, Biochemical oxygen demand, Eutrophication, Oxygen sag, Photosynthetic oxygen, Respiration, Fish populations, Freshwater fish, Bioassay, Lethal limit.
Identifiers: *Oxygen tension, Respiration rates.

During extensive sampling of populations of sticklebacks for parasites, it became apparent that marked differences existed in the distribution of the two British freshwater species. Observation of the survival, respiratory rates and distribution of three-spined and nine-spined sticklebacks from a variety of habitats supports the suggestion that physiologically, the nine-spined stickleback is much better adapted to life in closed, shallow, weedy, eutrophic waters, depleted in oxygen. By comparison, G. aculeatus favors more open, well oxygenated water. (Svensson-Washington)
W72-13344

CONTAMINATION OF MARINE LITTORAL AND SEA FOODS BY PESTICIDES, (CONTAMINATION DU LITTORAL MARITIME ET DES FRUITS DE MER PAR LES PESTICIDES),
Poitiers Univ. (France). Faculte de Medicine et de Pharmacie.
J. Brisou.
Mededelingen Faculteit Landbouw-Wetenschappen GENT, Vol 35, No 2, p 739-743, 1970. 3 tab, 3 ref. English summary.

Descriptors: *Pesticide residues, *Aquatic life, *Aquatic environment, *Water pollution, *Path of pollutants, *Public health, Enzymes, Analytical techniques, Pesticides, Fungicides, Organophosphorous pesticides, Chlorinated hydrocarbon pesticides, Carbamate pesticides, Organic pesticides, Herbicides, Water pollution sources, Plankton, Oysters, Shellfish, Algae, Mud, Sediments, Gas chromatography, Colorimetry.
Identifiers: Mercurial pesticides, Thin layer chromatography, Growth inhibition.

A systematic investigation of the French coasts of the Channel, the Atlantic and the Mediterranean Sea shows a significant pollution of muds, sediments, algae, plankton, and shellfish by pesticides. The per cent of contamination by one or several products is by approximation: oysters - 72%, other shellfish - 67%, algae - 66%, plankton- 100%, and water - 0%. The plankton is one of the most contaminated materials because mercurial fungicides are more prevalent than other pollutant products, and they are concentrated by the plankton. Data have been obtained using several techniques: growth inhibitions, anticholinesterase activity of extracts, thin layer chromatography, spectrocolorimetry, and in a few instances gas chromatography. (Svensson-Washington)
W72-13347

THE EFFECTS OF VARIATIONS IN OXYGEN TENSION ON CERTAIN ASPECTS OF RESPIRATORY METABOLISM IN PACIFASTACUS LENIUSCULUS (DANA) (CRUSTACEA:DECAPODA),
California Univ., Davis. Dept. of Zoology; and California Univ., Davis. Inst. of Ecology.
G. A. Moshiri, C. R. Goldman, G. L. Godshalk, and D. R. Mull.
Physiological Zoology, Vol 43, No 1, p 23-29, January 1970. 3 fig, 1 tab, 24 ref.

Descriptors: *Respiration, *Crayfish, *Metabolism, Oxygen, Dissolved oxygen, Biochemical oxygen demand, Oxygen requirements, Animal physiology, Water temperature, Ventilation, Lakes, Streams.
Identifiers: *Ventilation rates, *Oxygen utilization, Pacifastacus spp., *Lake Tahoe.

Responses of the crayfish, Pacifastacus leniusculus, from Lke Tahoe to variations in oxygen tension were determined under laboratory conditions. These results were supplemented by experiments which yielded data on ventilation rates, also under conditions of varying oxygen levels. Results show the relationship between oxygen concentration and uptake to be linear within the range tested. Ventilation rate remained constant with a decrease in oxygen level down to 2.5 ml/1, at which point it started to decline. The efficiency of oxygen utilization showed a mean of 22.1% down to a concentration of 3.88 ml/1, at which point it began to increase. In addition, a direct relationship was observed between utilization efficiency and increase in temperature. These results indicate that in this species the patterns of ventilation and oxygen utilization are direct consequences of a decrease in metabolism rather than adaptations for the regulation of oxygen uptake. (Svensson-Washington)
W72-13350

SLUDGE DUMPING IN THE FIRTH OF CLYDE,
Clyde River Purification Board, East Kilbride (Scotland).
For primary bibliographic entry see Field 05B.
W72-13351

THE WATER USE AND MANAGEMENT ASPECTS OF STEAM ELECTRIC POWER GENERATION.
National Water Commission, Arlington, Va. Consulting Panel on Waste Heat.
For primary bibliographic entry see Field 05B.
W72-13355

BENTHIC MACROINVERTEBRATES OF LAKE KOJIMA, WITH PARTICULAR REFERENCE TO POLLUTION EFFECTS OF INDUSTRIAL AND MUNICIPAL WASTES,
Ehime Univ., Matsuyama (Japan). Inst. of Biology.
Takeo Ito, Kazuo Kuwada, and Motomu Nikaido.
Mem Ehime Univ Nat Sci Ser B Biol. Vol 6, No 3, p 145-158. 1970. Illus. Map.
Identifiers: *Water pollution effects, *Benthos, Industrial wastes, Invertebrates, Japan, Lake Kojima (Japan), Limnodrilus sp, Municipal wastes, Water pollution, Tendipes halophilus, Tendipes plumosus.

Fauna and distribution of benthic macroinvertebrates of Lake Kojima were studied with special regard to the effects of the water pollution by industrial and municipal wastes, in Feb., Aug. and Nov. of 1967. Lake Kojima is a man-made shallow freshwater lake formed by damming across Kojima Bay opening into the Inland Sea of Japan. Fauna of the benthic macroinvertebrates showed a simple composition which consisted of 12 sp. and was dominated mostly by tubificid, Limnodrilus sp. and a tendipedid larva, Tendipes pulmosus or T. halophilus. BOD (Biochemical Oygen Demand) values of bottom waters indicated a considerably polluted condition with organic substances all over the study area ranging from 15 to 180 ppm. The maximum value was observed always at the station just below the outfall of paper-mill wastes in the Sasagase River. Dissolved O2 in the bottom water showed considerably lower concentrations in the Sasagase area, but it presented a supersaturation mostly in the lake proper area. In the deep region along the fairway extending over about 2 km below the outfall of the mill wastes, even the tubificid was not found possibly owing to the effects of the wastes and domestic sewages. In the northeastern deep part near the closure dam of the lake proper, no macrobenthos was found probably on account of a higher chlorinity and the presence of a large amount of sulfide in the habitat. The macrobenthos were most abundant in the study areas of the Kurashiki River, southwestern part of the lake proper and the flood-storage basin. Standing crops of the macrobenthos in the deep part along the fairway of the rivers and the lake proper were largest in Feb. and smallest in Aug.--Copyright 1972, Biological Abstracts, Inc.
W72-13366

OFFENSIVE-ODOR SUBSTANCE IN THE EVIL--SMELLING FISH FROM THE SEA-POLLUTED BY PETROLEUM AND PETROCHEMICAL INDUSTRIAL WASTE: I. IDENTIFICATION OF OFFENSIVE-ODOR SUBSTANCE,
Okayama Univ. (Japan). Dept. of Public Hygiene.
For primary bibliographic entry see Field 05A.
W72-13379

INFLUENCE OF INSECTICIDES ON ORGANOLEPTIC AND PHYSICO-CHEMICAL PROPERTIES OF WATER, (IN POLISH),
Jerzy Luczak.
Rocz Panstw Zakl Hig. Vol 22, No 2, p 113-132. 1971. Illus. English summary.
Identifiers: *Water pollution effects, Aldrin, *Insecticides, Methyl/palathion, Methoxychlor, Organoleptic properties, Physicochemical properties, Thiometon.

The levels of 4 pure insecticides (aldrin, methoxychlor, methylparathion, thiometon) and of 7 commercial formulas containing these products which cause changes in the color, odor or taste and result in foaming were determined for distilled and tap water. Pure thiometon caused change in the odor and taste of water at concentrations of 0.01 mg/l, while for aldrin a concentration of 1.0 mg/l was necessary. All commercial formulas caused changes in the odor and taste of both distilled and tap water at all levels investigated. The influence of pure insecticides and their derivatives on the course of nitrogen and oxygen transformation in the natural water taken from the Vistula river was also studied. All liquid commercial formulas caused a distinct increase of the index of absolute oxygen consumption of the water. Commercial formulas containing technical insecticides, mineral carriers, organic solvents, emulgators, stabilizers, and other substances added to improve the applicability of the formulas differ in their influence on organoleptic and physico-chemical properties of water from that of pure insecticides. In all investigations dealing with the influence of insecticides on the properties of water, the important practical aspect is the testing of commercial insecticides used.--Copyright 1972, Biological Abstracts, Inc.
W72-13393

INTERACTIONS OF LIGHT, TEMPERATURE AND MOISTURE ON TERBUTRYN TOXICITY,
Missouri Univ., Columbia. Dept. of Plant Pathology.
L. D. Houseworth, and B. G. Tweedy.
Weed Sci. Vol 19, No 6, p 732-735. 1971.
Identifiers: Avena sativa M, Cucumis sativus D, *Herbicides, Interactions, Light, Moisture, Temperature, *Terbutryn, *Toxicity, Triazine.

Toxicity of soil-applied 2- (tert-butylamino)-4 (ethylamino)-6- (methylthio)-s-triazine (terbutryn) to cucumbers (Cucumis sativus L. 'Gemni') and oats (Avena Sativa L. 'Nodaway') was increased 2.2 times when the light intensity was raised from 11,000 to 22,000 rumens/m2 and 1.5 times when the moisture level was raised from low (25 to 50% field capacity) to high (75 to 100% field capacity). When the temperature was raised from the low level (19 C day, 14 C night) to the high level (29 C day, 24 C night) toxicity of terbutryn to oats was increased 1.6 times and toxicity to cucumber was increased 1.3 times. Analysis of interactions of the 3 variables on toxicity of terbutryn showed that environmental conditions favoring rapid growth resulted in an increase in phytotoxicity.--Copyright 1972, Biological Abstracts, Inc.
W72-13395

CORRELATION BETWEEN PRIMARY PRODUCTION, PLANKTON GROWTH AND LIGHT IN THE KUMMEROWER LAKE (MECKLENBURG),
Rostock Univ. (East Germany). Institut fuer Hygiene.
For primary bibliographic entry see Field 02H.
W72-13401

THE VERTICAL DISTRIBUTION OF THIAMINE, BACTERIA AND PHYTOPLANKTON IN THREE LAKES IN EAST HOLSTEIN,
Muenster Univ. (West Germany). Botanisches Institut und Botanischer Garten.
H. Hagedorn.
Ber Deut Bot Ges, Vol 82, No 3/4, p 223-234, 1969, Illus, English summary.
Identifiers: *Limnology, *Bacteria, Distribution, Germany, Lakes, *Phytoplankton, *Thiamine.

The relationship between heterotrophic bacteria, phytoplankton and thiamine content of some lakes in East Holstein, Germany was studied. The bacteria were the most important producers of thiamine. The phytoplankton had no direct influence on the vitamin content of the water.--Copyright 1972, Biological Abstracts, Inc.
W72-13402

PLANTS AND INDUSTRIAL WASTE,
Liverpool Univ. (England).
A. D. Bradshaw.
Bot Soc Edinburgh Trans, Vol 41, No 1, p 71-84, 1970.
Identifiers: *Industrial wastes, Metals, Mines, Moisture, Nutrients, *Plants, Toxicity.

The growth of plants on man-made habitats, such as old metal mine workings, was studied. Metal toxicity, a shortage of major plant nutrients, and soil moisture deficiency characterize these habitats; it is suggested recent evolution has produced a tolerance for these conditions on the part of plant pioneers.--Copyright 1972, Biological Abstracts, Inc.
W72-13418

CALEFACTION AND PHYTOPLANKTON,
Maryland Univ., College Park, Md. Dept. of Botany.
C. Sorokin.
Bioscience. Vol 21, No 23, p 1153-1159. 1971. Illus.
Identifiers: *Thermal pollution, *Algae, *Phytoplankton, Temperature.

The overall biological effects of increase in temperature of aquatic habitats range from harmful to beneficial. Observations on green high-temperature algae indicate that the most competitive of these organisms not only tolerate higher temperatures but actually outperform the low-temperature forms over a wide temperature range. A planned seeding of natural waters, with an assemblage of organisms selected for their adaptability and competitive performance at higher temperatures, merits consideration among possible solutions of the calefaction problem.--Copyright 1972, Biological Abstracts, Inc.
W72-13420

THE ROLE PLAYED BY THE FISHERIES RESEARCH BOARD OF CANADA IN THE 'RED' HERRING PHOSPHORUS POLLUTION CRISIS IN PLACENTIA BAY, NEWFOUNDLAND,
Fisheries Research Board of Canada, Halifax (Nova Scotia).
P. M. Jangaard.
A.R.O. Circular Number 1, Fisheries Research Board of Canada, 1970. 20 p, 10 fig, 2 tab.

Descriptors: *Herrings, *Fishkill, *Phosphorus, Water pollution effects, *Bioassay, *Pollution abatement, Pollution identification, Water pollution sources, Industrial wastes, Bottom sediments, Toxicity.
Identifiers: *Red herring, *Placentia Bay, (Newfoundland).

Red herring fishkills caused by phosphorus in industrial wastes caused acute problems in Placentia Bay, Newfoundland. The use of phosphorus in production resulted in a highly toxic effluent which caused hemolysis of the blood and a breakdown of the lining of gill lamellae in local fish populations. Sensitivity to phosphorus poisoning was detected at concentrations of 2.5 ppb. Retention in harbor sediments coupled with high effluent discharge resulted in retention and treatment of all effluents and dredging of the harbor bottom. (Ensign-PAI)
W72-13439

UPTAKE OF COBALT-58 BY MUSSEL, MYTILUS EDULIS,
Tokyo Univ. (Japan). Dept. of Fisheries.
For primary bibliographic entry see Field 05B.
W72-13440

EFFECT OF PESTICIDE CHEMICALS ON MARINE ORGANISMS,
Stanford Univ., Pacific Grove. Hopkins Marine Station.
J. H. Phillips.
In: Agricultural Chemicals - Harmony or Discord for Food, People, Environment, 1971, University of California, Division of Agricultural Sciences, J. E. Swift, editor. p 68-79.

Descriptors: *Water pollution effects, *Pesticide residues, *Water pollution treatment, *Pesticide toxicity, *Water pollution sources, Chemical wastes, Pesticides, Agricultural chemicals, Pollution abatement, Bioassay, DDT, Mercury.

Pesticide residues accumulating in the marine environment offer serious economical and biological effects. Condemnation of fish products due to pesticide residue content is increasing. Residue levels in marine organisms have been correlated with abnormalities and population declines. The results of preventive measures are extremely long term as illustrated by increased residue levels in sediments where input has declined. (Ensign-PAI)
W72-13441

FERTILIZED SEA URCHIN EGGS AS AN INDICATORY MATERIAL FOR MARINE POLLUTION BIOASSAY, PRELIMINARY EXPERIMENTS,
Doshisha Univ., Kyoto (Japan). Biological Lab.
N. Kobayashi.
Publications of the Seto Marine Biological Laboratory, Vol 18, No 6, p 379-406, March 1971, 2 fig, 8 tab, 16 ref.

Descriptors: *Bioassay, Water pollution effects, Aquatic animals, *Bioindicators, *Embryonic growth stage, *Fertilization, *Pollution identification, Heavy metals, Salinity, Density.
Identifiers: *Sea urchin eggs, Hatakejima Island (Japan).

A series of bioassays were made to measure pollution around Hatakejima Island using sea urchin eggs and embryos as indicator organisms. Normal fertilization, cleavage to gastrulation and the anomalies of polyspermic cleavage, permanent blastula and exogastrula were used for pollution indicators. In polluted water samples, no fertilization occurred, and when density was increased some fertilization took place with development to gastrula, though first cleavage was retarded and a high percentage of permanent blastula resulted. Heavy metals induced multicells, permanent blastula and exogastrula. Other chemicals caused similar results with less polyspermy and exogastrucation. (Ensign-PAI)
W72-13442

DDT INHIBITS NA+, K+, MG2+ -ATPASE IN THE INTESTINAL MUCOSAE AND GILLS OF MARINE TELEOSTS,
Mt. Desert Island Biological Lab., Salisbury Cove, Maine.
R. H. Janicki, and W. B. Kinter.
Nature New Biology, Vol 233, No 39, p 148-149, September 29, 1971, 1 fig, 1 tab, 18 ref.

Descriptors: *DDT, *Teleosts, *Marine fish, *Pesticides, *Toxicity, Enzymes, Chlorinated hydrocarbon pesticides, Pesticide residues, Osmosis, Sodium, Potassium, Magnesium.
Identifiers: ATPase, Intestinal mucosae, Gills, Frenchman Bay - Gulf of Maine.

The interaction of the organochlorine insecticide DDT, with sodium-potassium-activated, magnesium dependent, adenosine triphosphatase inhibits the osmoregulatory functions of Na+, K+, Mg2+ -ATPase in the intestinal mucosae and gills of marine teleosts. Concentrations between 1 and 50 ppm of DDT restricted sodium transport as much as 54%, a function which is believed affected by the enzyme Na+, K+, Mg2+ -ATPase. (Ensign-PAI)
W72-13444

INCIDENCE OF R+ ESCHERICHIA COLI IN COASTAL BATHING WATERS OF BRITAIN,
Animal Health Trust, Stock (England). Farm livestock Research Centre.
For primary bibliographic entry see Field 05B.
W72-13445

HOPKINS MARINE STATION,
Stanford Univ., Pacific Grove. Hopkins Marine Station.
For primary bibliographic entry see Field 05B.
W72-13450

THERMAL POLLUTION IN UNCHARTED WATERS.

Environmental Science and Technology, Vol 5, No 12, p 1170-1171, December 1971.

Descriptors: *Thermal pollution, *Water pollution treatment, *Water pollution effects, *Hydroelectric plants, Heated water, Water pollution sources, Pollution abatement, Environmental engineering, Resources.

Additional investigations into the extent and allowable limit of thermal pollution caused by industrial use of water is required for the adequate protection of the environment. Effective heat treatment methods have been developed, but economic factors must be considered. Studies in utilization

of waste heat for industrial and biological production have proposed thermal pollution as a potential resource of the future. (Ensign-PAI)
W72-13452

LAKE SUPERIOR--A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.
For primary bibliographic entry see Field 02H.
W72-13480

LAKE MICHIGAN--A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.
For primary bibliographic entry see Field 02H.
W72-13481

LAKE HURON--A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.
For primary bibliographic entry see Field 02H.
W72-13482

STUDIES ON THE PLANTS OF THE GENESEE COUNTRY (WESTERN NEW YORK STATE): VI. THE AQUATIC FLORA OF CONESUS LAKE,
State Univ. Coll., Geneseo, N.Y.
H. S. Forest, and E. L. Mills.
Proc Rochester Acad Sci. Vol 12, No 2, p 110-138. 1971. Illus. Maps.
Identifiers: *Aquatic plants, Angiosperms, Coliforms, *Conesus Lake (N.Y.), New York, Phosphorus, Plants, Sewage, Water pollution effects.

Included in the ecological consideration of the lake are: a study of the sewage increase and its relationship to coliform counts and the pollution of the environment and an analysis of the pattern of P content and distribution in the lake. Preliminary distribution data and quantitative community analysis of the flora, including 26 genera and 43 spp. of angiosperms, are presented and discussed. (See also W72-13488)--Copyright 1972, Biological Abstracts, Inc.
W72-13487

STUDIES ON THE PLANTS OF THE GENESEE COUNTRY (WESTERN NEW YORK STATE): VIII. ALGAE OF CONESUS LAKE, LIVINGSTON COUNTY, NEW YORK: INITIAL REPORT,
State Univ. Coll., Geneseo, N.Y.
P. G. Savard, and D. N. Bodine.
Proc Rochester Acad Sci. Vol 12, No 2, p 146-159. 1971. Map.
Identifiers: *Aquatic, Algae, Cladophora, *Conesus Lake (N.Y.), New York, Plankton, Plants, Seasonality, Species.

The floral list consists of 66 genera and 101 spp. A dense planktonic bloom and a profuse growth of Caldophora have been given special attention. The monthly distribution of plankton algae during 1967 is summarized. (See also W72-13487)--Copyright 1972, Biological Abstracts, Inc.
W72-13488

TRACE ELEMENTS DETAILED IN LAKE MICHIGAN.
For primary bibliographic entry see Field 05B.
W72-13489

COMPARISONS OF TWO ANTARCTIC LAKES WITH DIFFERENT TROPHIC STATES,
Virginia Polytechnic Inst. and State Univ., Blacksburg.
G. L. Samsel, Jr., and B. C. Parker.
Va J Sci, Vol 22, No 4, p 177-182, 1971, Illus.
Identifiers: *Limnology, Antarctic, *Lakes, Minerals, Photosynthesis, Oligotrophy, Eutrophication, Water pollution effects.

Compared were primary productivity, physical features, and chemical and biological composition of an oligotrophic and an eutrophic lake during Jan. 1970 at Anvers Island, Antarctica. Both lakes, less than 500 m apart, had partial ice cover the entire season and were underlain with similar silica-rich granite. Striking dissolved chemical differences were Cl- (7.5 and 35.0 mg/l), NH4+-N (0.1 and 2.5 mg/l), and organic C (0.97 and 6.94 mg/l), total PO4 -P (0.03 and 1.7 mg/l), respectively, for the oligotrophic and eutrophic lake. Particulate organic C was 0.031 and 0.144 mg/l. Extractable total chlorophyll ranged from 15-41 mg/m3 and 35-112 mg/m3 in the 2 lakes during the 3 wk study period. Ranges in net photosynthesis were 0.78-3.5 and 9.0-72.0 mg C/m3/hr, respectively, in the oligotrophic and eutrophic lakes. Diel ranges for chlorophyll and C fixation also fell within these values. The advanced degree of eutrophication of one lake over the other apparently was induced initially by surpluses of NH4+-N and PO4 -P.--Copyright 1972, Biological Abstracts, Inc.
W72-13511

THE ENVIRONMENTAL ACCEPTABILITY OF NTA: CURRENT RESEARCH AND AREAS OF CONCERN,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
R. D. Hamilton.
In: Nutrients and Eutrophication: The Limiting-Nutrient Controversy, Feb. 11-12, 1971, W. K. Kellogg Biological Station, Michigan State University, East Lansing. Special Symposia, Vol. 1, 1972, p 217-221. 1 tab, 5 ref.

Descriptors: *Nitrilotriacetic acid, *Detergents, Water pollution sources, *Aquatic animals, Phosphates, *Toxicity, *Testing procedures, Regulation, Standards, Water pollution effects.
Identifiers: *NTA.

The detergent industry and the governments of several countries have extensively tested nitrilotriacetic acid (NTA) as a potential replacement for phosphates in detergents. An outline of the testing procedures is discussed with consideration of the possibility that in the future tests may be required of all compounds introduced into the environment. It is suggested that test protocols for various classes of compounds, based on usage and toxicity, be established. Registration might be required with periodic review. Large scale priority research of test organisms in order to assay responses to stress other than that of death might be initiated. (See also W72-09175) (Ensign-PAI)
W72-13548

POLYCHLORINATED BIPHENYLS AND THE ENVIRONMENT.

Interdepartmental Task Force on PCBs Report, May 1972. 181 p, 10 fig, 40 tab.

Descriptors: *Water pollution sources, *Water pollution effects, *Polychlorinated biphenyls, *Toxins, Environmental effects, Ecology, Public health, Reviews, Federal Government, Inter-agency cooperation, Industries, Pollution abatement, Chemical properties, Physical properties.
Identifiers: Polychlorinated biphenyl uses, Government policies.

The chemicals known as PCBs--polychlorinated biphenyls--were reviewed by Five Federal agencies, with participation by other agencies. The Interdepartmental Task Force on PCBs coordinated its scientific efforts to better understand PCBs and to strengthen the Government's ability to protect the public from hazards associated with them. The task force made nine findings, conclusions, and recommendations, emphasizing that PCBs should be restricted to essential or nonreplaceable uses which would minimize the likelihood of human exposure or leakage to the environment. Supplementing the 20-page report are eight appendices detailing current knowledge about various aspects of PCBs, including their use replaceability; occurrence, transfer, and cycling in the environment; occurrence and sources in food; and PCBs effects on man and animals. (Woodard-USGS)
W72-13569

REVIEW OF THE RELATION OF WATER QUALITY AND SIMPLE GOITER,
Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio.
For primary bibliographic entry see Field 05F.
W72-13607

5D. Waste Treatment Processes

SOLUBLE PHOSPHORUS REMOVAL IN THE ACTIVATED SLUDGE PROCESS - PART I - CHEMICAL-BIOLOGICAL PROCESS PERFORMANCE.
Soap and Detergent Association, New York

Copy available from GPO Sup Doc EP2.10:17010 EIP 05/71, $1.25; microfiche from NTIS as PB-211 563, $0.95. Environmental Protection Agency Water Pollition Control Research Series, May 1971. 119 p, 27 fig, 18 tab, 53 ref. EPA Program 17010 EIP 05/71.

Descriptors: *Phosphorus, *Chemical precipitation, *Activated sludge, *Aluminum, *Efficiencies, *Nitrification, Waste water treatment, Effluents, Costs.
Identifiers: *Operations, *Alum, *Aluminate, *Chemical removal, Waste sludge, Dosages.

The objective was to develop and evaluate, at full plant scale, the combined chemical-biological process of phosphorus removal. Phase I investigations indicated an Al/P (filt. ortho) weight ratio of 2.25/1 was necessary to reduce the influent phosphorus of approximately 10 mg P/l to approximately 0.3 mg P/l in the filtered effluent. Alum proved to be a more effective precipitant than sodium aluminate in the moderately alkaline wastewater available for this study. The best results were obtained when the chemical was added at or near the effluent end of the aeration tank. Total phosphorus concentration of the unfiltered effluent was dependent upon effluent suspended solids levels as on effluent soluble phosphorus concentrations. Removal of organic matter was improved as a result of chemical addition in the chemical-biological process. The chemical-biological process produced approximately twice as much weight of sludge as did the parallel control. Alum addition did not reduce the sludge volume index (SVI) of the mixed liquor whereas sodium aluminate addition resulted in significant decreases. Costs for chemical precipitation of phosphorus in the chemical-biological process are estimated to vary from 7.3 cents/1000 gal in a 1 MGD plant to 4.1 cents/1000 gal in a 100 MGD plant for 97% removal. (See also W72-13040) (EPA abstract)
W72-13039

SOLUBLE PHOSPHORUS REMOVAL IN THE ACTIVATED SLUDGE PROCESS, PART II, SLUDGE DIGESTION STUDY.
Soap and Detergent Association, New York.

Copy available from GPO Sup Doc EP2.10:17010 EIP 10/71, $0.65; microfiche from NTIS as PB-211 564, $0.95. Environmental Protection Agency Water Control Research Series, October 1971. 59 p, 20 fig, 4 tab, 23 ref. EPA Program 17010 EIP 10/71.

Descriptors: *Phosphate, *Chemical precipitation, *Domestic wastes, *Activated sludge, Sludge digestion, Solubility, Separation techniques, Nutrients, Nitrification, Dewatering, *Waste water treatment.
Identifiers: *Aluminum, Sludge gasses, Sludge dewatering, Alkalinity, Volatile acids.

Sludges containing aluminum phosphorus precipitates from an activated sludge wastewater treatment plant were digested in a high-rate digester. Sodium aluminate and liquid alum were used to precipitate the phosphorus from the wastewater. Analyses on both raw and digested sludges showed that once precipitated from the wastewater and incorporated into a sludge the phosphorus did not redissolve while undergoing anaerobic digestion. Most of the soluble phosphorus in both the raw and digested sludges was in the orthophosphate form, and the addition of the inorganic aluminum phosphorus complexes did not adversely effect the anaerobic digester. High concentrations of soluble aluminum ion did not appear in the anaerobic digester, and the use of alum for phosphorus removal caused no additional hydrogen sulfide production during sludge digestion. Analyses also indicated the addition of aluminum compounds enhanced the dewatering properties of the raw sludges. (See also W72-13039) (Lowry-Texas)
W72-13040

GRANULAR CARBON ADSORPTION IN COLUMNS,
Texas A and M Univ., College Station. Environmental Engineering Div.
T. Reynolds.
April 1972. 80 p, 29 fig, 2 tab, 24 ref. EPA Program 17090 DHA.

Descriptors: *Waste water treatment, Filters, *Carbon filters, *Carbon, *Adsorption, Granules, Design, Equations.
Identifiers: *Counter-current carbon columns, *Carbon columns, *Fixed and moving bed columns.

The reclamation of wastewaters to obtain high quality waters is being done in some parts of the United States now. In the future, water reuse will undoubtedly become widespread in many of the states. Granular carbon is one of the most promising unit processes for removal of organic matter from wastewater. Counter-current carbon columns provide the most efficient uses of granular carbon. The objective was to develop equations for the design of counter-current carbon filters. The equation derived is based on McBain's isotherm. Although the equation was verified, sensitivity studies should be made to obtain the range of application. In addition to this equation, another equation, based on Langmuir's isotherm, was developed for fixed carbon columns. Additional studies to apply the equation to counter-current conditions would be useful. (EPA abstract)
W72-13041

THE COST OF CLEAR WATER, VOLS I AND II.
Environmental Protection Agency, Washington, D.C.

Annual Report of the Administrator of the Environmental Protection Agency to the Congress of the United States, Senate Document No. 92-23, June, 1971. 128 p, 11 fig, 31 tab, 1 append.

Descriptors: *Water pollution, *Waste treatment, *Treatment facilities, Local governments, Federal government, Grants, Costs, Pollution abatement, Economic efficiency.
Identifiers: *Environmental protection.

Volume I discusses the cost estimates for municipal waste treatment facility needs as of December, 1970. The estimates are based upon a survey made by the Water Quality Office, Environmental Protection Agency. The study suggests a total investment need of $12.6 billion for municipal waste treatment facilities covering the period December, 1970 through the end of Fiscal Year 1974. Because of ongoing efforts in EPA, efficiency gains may decrease this investment need to $12.0 billion. The question of efficiency is discussed in detail in Volume II. The aspects considered include (1) the distribution of investments as compared to the distribution of polluting activities and the location of water pollution, (2) the efficiency of municipal and industrial waste treatment investments in reducing oxygen demand and nutrients in sewage, (3) avoidable increases in local operating, maintenance, financing, and overhead costs of waste treatment, and (4) the questionable strategy of using investment capital essentially to forestall some future needs while at the same time permitting the persistence of existing system deficiencies. The discussion is supported by numerous stables and graphs. A National Industrial Conference Board survey questionnaire entitled 'Study of Water Pollution Abatement Costs' is also included. (Settle-Wisconsin)
W72-13079

TREATMENT-COST RELATIONSHIP FOR INDUSTRIAL WASTES,
Vanderbilt Univ., Nashville, Tenn.
W. W. Eckenfelder, Jr., and J. L. Barnard.
Chemical Engineering Progress, Vol 67, No 9, p 76-85, September, 1971. 9 fig, 9 tab, 7 ref.

Descriptors: *Industrial wastes, *Treatment facilities, *Recycling, *Costs, Operating costs, Water quality standards, Water quality, Mathematical models.
Identifiers: *Multiple reuse.

Multiple reuse of water by a firm is normally called for when the supply of good water is limited and cost is high. To decide whether such multiple reuse is advisable, it is necessary to compare costs of fresh water and the treatment operations necessary to bring the waste to a required quality level. An economic balance or net cost equation can be expressed as the sum of supply-water cost, treatment-for-use cost, treatment-for-disposal cost, treatment-for-reuse cost, and treatment-for-product-recovery cost minus the value of the product recovered. Thus, the economic feasibility of recycling depends upon the net savings effected by handling a smaller volume of water, after the cost of treating the effluent for recycling has been considered. Recycling is most attractive when contaminants are either low in content or easily removed, when quality requirements are flexible, and when final effluent requirements are relatively stringent. Once-through water use systems become necessary when water quality requirements are inflexible, as in food processing and brewing operations. The capital and operating cost estimates necessary for system evaluation are obtainable from survey data or from data generated by mathematical cost models. (Settle-Wisconsin)
W72-13083

MICROBIOLOGICAL UTILIZATION OF SULPHITE LIQUOR,
British Columbia Research Council Vancouver.
J. C. Mueller, and C. C. Walden.
Process Biochemistry, June 1970. 4 p, 1 fig, 3 tab, 40 ref.

Descriptors: *Pulp wastes, *Sulfite liquors, *Waste disposal, *Ultimate disposal, *Biodegradation, *Anaerobic digestion, *Waste treatment, *Biological treatment, *Microbial degradation, Wood wastes, Industrial wastes, Biochemical oxygen demand, Disposal, Byproducts, Lignins, Carbohydrates, Organic compounds, Proteins, Yeasts, Fermentation, Alcohols, Methane, Hydrogen sulfide.
Identifiers: *Waste conversion, *Wood sugars, *Waste utilization, Usable byproducts, Sugars, Lignosulphonates, Utilization, Rhizops spp., Fumaric acid, Ethanol, Acetone, Butyl alcohol, Latic acid, Propionic acid.

Research is now directed toward disposal of, and development of saleable byproducts from, the lignin and wood sugars in spent sulphite liquor (SSL) from pulp mills. The potential of microbiological methods for treating SSL is discussed. Because no reasonable microbial degradation of lignosulphonates is yet known, suggestions for biological utilization of SSL center around commercial fermentation of the soluble sugars. Conversion of SSL carbohydrate to yeast protein and Rhizopus spp. production of fumaric acid are considered, as is the potential anaerobic production of ethanol, acetone-butyl alcohol, lactic and propionic acids, methane, and hydrogen sulfide for recycling of sulfur in the pulping process. (LeGore-Washington)
W72-13098

FERMENTATIVE UTILIZATION OF SPENT SULPHITE LIQUOR, A REVIEW AND PROPOSAL,
British Columbia Research Council Vancouver. Div. of Applied Biology.
J. C. Mueller.
Pulp and Paper Magazine of Canada, Vol 71, No 22, p 3-7, November 20, 1970. 4 tab, 31 ref.

Descriptors: *Pulp wastes, *Sulfite liquors, *Waste disposal, *Ultimate disposal, *Biodegradation, *Anaerobic digestion, *Waste water treatment, *Biological treatment, *Microbial degradation, Wood wastes, Industrial wastes, Biochemical oxygen demand, Disposal, Byproducts, Lignins, Carbohydrates, Organic compounds, Proteins, Yeasts, Fermentation, Alcohols, Methane.
Identifiers: *Waste conversion, *Wood sugars, *Waste utilization, Sugars, Lignosulphonates, Utilization, Rhizopus spp., Fumaric acid, Lactic acid, Propionic acid, Ethanol.

Spent sulphite liquor contains 10-13% soluble organics, which represent up to 50% of the wood raw material used in the pulping process. Efforts to utilize these organics by chemical or biological techniques have been only partially successful. A number of fermentation processes which yield saleable products from spent sulphite liquor are discussed. They have in common that they center solely on the carbohydrate fraction of the spent solids, but do not utilize the lignin derivatives. It is proposed to develop new fermentation processes which would permit the degradation or transformation of lignosulphonates into useful products. (LeGore-Washington)
W72-13107

AN APPLICATION OF NETWORK THEORY TO WATER MANAGEMENT IN POULTRY PROCESSING,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
R. C. Ward, D. A. Link, and W. M. Crosswhite.
Water Resources Bulletin, Vol 8, No 3, p 495-504, June, 1972. 2 fig, 3 tab, 15 ref.

Descriptors: *Water management (Applied), *Linear programming, *Networks, Poultry, *Waste water treatment, Costs, Optimization, Food processing industry, Waste treatment, *North Carolina.
Identifiers: Network theory, *Poultry processing wastes, *Durham (NC).

With greater importance now being attached to conserving the quantity and quality of water resources, poultry-processing plants face the prospect of rising costs for water and waste treatment. A technique is presented for choosing an op-

timum combination of proposed modifications to minimize water flow through a poultry processing plant. A particular class of modifications is considered: changes in water-flow arrangements and process characteristics to reduce fresh water intake and waste-treatment costs. Existing and proposed flows are represented as a network, and linear programming is used to solve the minimum-flow problem for the network. The technique is applied to a typical plant in Durham, North Carolina. Results show fresh water intake can be reduced by 45% to 51%. Poultry processing plant modifications are classified by type, and the relative importance and effectiveness of each type are discussed. (Bell-Cornell)
W72-13137

AN 'OPTIMIZED MODULE' APPROACH TO WASTE WATER RECLAMATION DESIGN,
Kennedy Engineers, San Francisco, Calif.
R. A. Ryder, and M. T. McGovern.
Water Research, Vol 6, Nos 4/5, p 357-364, April/May, 1972. 2 fig, 1 tab.

Descriptors: *Waste water (Pollution), *Reclamation, *Treatment facilities, *Aerobic treatment, *Hawaii, Water supply, Eutrophication, Systems analysis, Optimization, Planning, Irrigation, Water quality, *Water reuse, Effluents, Quality control.
Identifiers: Coastal waters.

The concept of a number of relatively small waste water reclamation facilities rather than provision of centralized collection and treatment is particularly attractive when there is a broad need for irrigation with the reclaimed waste water, and concurrent development and growth of contiguous areas is not likely to occur. In concept, the modular approach immediately satisfies two primary goals: maximum standardization of process and mechanical equipment, and unlimited capability for expansion. Presented is a discussion of the optimization of a matrix created by 10 waste water reclamation design objectives and their relative degrees of dependent improvement. Included among these objectives are: minimum operational and maintenance cost; maximum process flexibility; and optimum power demand to system demand relationships. The result is the creation of a reclamation module utilizing aerobic biological treatment. The area being planned for is the Ka'u district of Hawaii. It is determined that the largest treatment module that could be constructed considering initial cost, projected growth, service area, and nearby land requiring irrigation would provide the most economic overall selection. The treatment process is designed to provide optimum effluent quality for reuse as irrigation water for golf courses, parks, pastures, orchards, and urban greenbelt. (Bell-Cornell)
W72-13138

MECHANISM OF DEGRADATION OF WOOD AND PULP PRODUCTS IN WATER SOLUTION,
Arizona Univ., Tucson. Dept. of Chemistry.
For primary bibliographic entry see Field 05B.
W72-13181

THE PROBLEM OF WASTE WATER AND OF SLUDGE IN RURAL SETTLEMENTS,
G. P. Schmidt, and K.-H. Bollow.
Z Gesamte Hyg Grenzgeb. Vol 17, No 7, p 498-503. 1971.
Identifiers: *Rural areas, Sludge treatment, *Waste water treatment, *Activated sludge.

The economic, hygienic, and constructional aspects of various waste water purification installations in rural settlements where the composition of waste water is subjected to wide fluctuations are discussed and the advantages and limitations of aeration and activated-sludge ditches, of small activated sludge plants, of small clearing plants and of aeration and stabilization ponds are outlined. All aeration waste water purification methods require the periodic removal of accumulated sludge. Small activated sludge plants with extended aeration developed in the USA which do not require sludge removal suffer from problems of a hydraulic nature. Aeration and stabilization ponds with or without preliminary unaerobic treatment tanks are probably the most satisfactory method of waste water treatment under rural conditions.--Copyright 1972, Biological Abstracts, Inc.
W72-13214

TIME-INTEGRATED THERMAL EFFECTS OF FOREST IRRIGATION,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
R. Lee, and W. E. Sharpe.
Forest Science, Vol 15, No 2, June 1969, p 114-120. 3 fig, 2 tab, 11 ref. OWRR A-012-PA (5).

Descriptors: *Sewage effluents, *Water reuse, *Irrigation effects, Forests, Microclimatology, *Air temperature, *Soil temperature, *Thermal conductivity.
Identifiers: Evaporative cooling, *Red pine, *Hardwoods.

Closed stands of planted red pine and mature hardwoods were irrigated with either 1 or 2 inches per week of treated sewage effluent. Vertical temperature profiles obtained with the sucrose hydrolysis method showed that air temperatures at breast height and in the canopy were 0.1 to 0.8C lower in treated stands as a result of additional evaporative cooling. Soil temperatures in treated stands were as much as 1.2C higher due to increased thermal conductivity. Magnitudes of the effects varied with forest stratum and forest type, and with the amount and mode of irrigation, and with seasonal weather. (Galwardi-Texas)
W72-13247

FACTORS AFFECTING BIOLOGICAL DENITRIFICATION OF WASTEWATER,
Environmental Protection Service, Hamilton (Ontario). Canada Centre for Inland Waters.
R. N. Dawson, and K. L. Murphy.
Preprint, presented at 6th International Water Pollution Research Conference, Session 15, Hall C, Paper No 31, June 23, 1972. 10 p, 7 fig, 1 tab, 19 ref.

Descriptors: *Denitrification, Design criteria, Design data, Biological treatment, *Waste water treatment, Hydrogen ion concentration, *Nitrates, Temperature, Activated sludge, Time, Retention, Statistical methods, Laboratory tests, Laboratory equipment.
Identifiers: Denitrification rate, *Carbon-nitrate rates, *Pseudomonas denitrificans, Variance analysis.

A laboratory study was conducted to determine the relative importance and interactions between variables affecting the unit denitrification rate, namely, pH, organism concentration, nitrate concentration and carbonnitrate ratio. The concentration versus time curves and analysis of variance of the experimental designs indicate that the denitrification rate was independent of carbon and nitrate concentration providing sufficient organic carbon was added to satisfy the nitrate reduction and organism growth. The optimum pH for denitrification with Pseudomonas denitrificans was 7.0. Activated sludge from an extended aeration plant denitrified at 27C as if 20-25% by weight were composed of organisms with an equivalent unit nitrate reduction rate as P. denitrificans. The unit denitrification rate of Pidenitrificans can be approximated by an Arrehmius type temperature dependency between 3C and 27C. At 5C the unit rate was sufficiently high to allow use of this process if stirred tank detention times of 3 to 8 hours and higher organism populations, 5,000 mg/l, were used. (Galwardi-Texas)
W72-13250

NUTRIENT REMOVAL THROUGH NATURAL SAND BEDS,
Rensselaer Polytechnic Inst., Troy, N.Y. Bio-Environmental Engineering Div.
T. P. Glavin, and J. A. Romero.
Master's Thesis, August 1968. 106 p, 19 fig, 12 tab, 39 ref.

Descriptors: *Waste water treatment, *Municipal wastes, *Filtration, Sands, Nutrients, Performance, Efficiencies, Depth, Biochemical oxygen demand, Coliforms, Nitrates, Phosphates, *New York.
Identifiers: *Nutrient removal, *Sand filters, *Lake George (NY).

In recent years an increase in nutrient concentration has been noted at the south end of Lake George near Lake George Village, N.Y. An investigation was conducted to determine if the wastewater treatment plant had any effect on this increased nutrient concentration. The treatment plant discharges its effluent onto natural sand seepage beds which are greater than 25 ft. deep. The removal efficiency of the sand beds with respect to coliforms, BOD, chlorides and nitrogen and phosphorus compounds was investigated. Results showed that when the sand beds were dosed, they were no longer saturated at 15 feet. Ten feet of sand was found to remove coliforms by 99% and BOD by 96%. However, nitrates, phosphates, and chlorides remained in significant concentrations after 10 feet of sand filtration. (Galwardi-Texas)
W72-13251

THE MICROBIOLOGY OF AN ACTIVATED SLUDGE WASTEWATER TREATMENT PLANT CHEMICALLY MODIFIED FOR PHOSPHORUS REMOVAL,
Pennsylvania State Univ., University Park. Dept. of Microbiology.
J. A. Davis.
Ms. Thesis, June 1972. 94 p, 4 fig, 16 tab, 78 ref. OWRR A-018-PA (2).

Descriptors: Microbiology, *Activated sludge, *Chemical precipitation, *Waste water treatment, *Microorganisms, *Phosphorus, Coliforms, Biological treatment.
Identifiers: *Alum treatment, Fecal coliforms, *Fecal streptococci, Most probable number.

The microbiology of a full scale activated sludge treatment plant modified to permit chemical precipitation of phosphorus employing aluminum sulfate as the precipitant was investigated. The investigation consisted of: enumeration of microorganisms present in activated sludges with and without the aluminum precipitates formed by alum addition to mixed liquor, and most probable number estimates of activated sludge microorganisms and levels of total coliforms, fecal coliforms and fecal streptococci present in the wastewater treatment plant effluent. It was concluded that the microflora of conventional activated sludge was modified to some extent by the addition of alum, probably by aluminum hydroxopolymers. Alum treatment of wastewater appeared to enmesh microorganisms. Also, alum treatment augmented reduction of wastewater bacteria, total coliforms, fecal coliforms and fecal streptococci. (Galwardi-Texas)
W72-13252

OIL/WATER SEPARATION SYSTEM WITH SEA SKIMMER.
AiResearch Mfg. Co., Los Angeles, Calif.
For primary bibliographic entry see Field 05G.
W72-13253

OPTIMIZATION OF AMMONIA REMOVAL BY ION EXCHANGE USING CLINOPTILOITE.
California, Univ., Berkeley. Sanitary Engineering Research Lab.

Copy available from GPO Sup Doc EP2.10:17080-DAR-09/71, $1.50; microfiche from NTIS as PB-211 605, $0.95. Environmental Protection Agency, Water Pollution Control Research Series, September 1971. 189 p, 35 fig, 29 tab, 105 ref. EPA Program 17080 DAR 09/71.

Descriptors: *Tertiary treatment, *Ion exchange, *Municipal wastes, *Ammonia, Nitrogen, Cation exchange, Zeolites, *Waste water treatment, Cost analysis, Estimated costs, Optimization, Performance, Efficiencies, Water reuse, Hydrogen ion concentration.
Identifiers: Clinoptilolite, Chemical-physical treatment, Advanced waste water treatment, Regeneration.

The zeolite ion exchanger clinoptilolite was investigated with the objective of optimizing its application to ammonia removal from wastewaters. The study included multiple cycle pilot plant operations at three municipal sewage treatment plants. Particular attention was given to cation interference with exhaustion performance and with minimum cost regeneration. The ammonia capacity of clinoptilolite was found to be nearly constant over the pH range of 4 to 8, but diminished rapidly outside this range. In regeneration the pH was critical in determining the NaCl requirements, a higher pH favoring lesser amounts of salt. However, at a pH over 12.5 zeolite attrition became excessive and exchanger makeup contributed significantly to operating costs. An average ammonia removal of 95.7% was obtained in demonstration studies on three municipal wastes having an NH3-N content of about 20 mg/l. The cost of ammonia removal using clinoptilolite for a 10-mgd plant operating under these conditions was estimated to be $0.082/1000 gallons. Ammonia removals down to less than 0.5 mg/l NH3-N is technically feasible, but only with shorter exhaustion runs and greater regenerant requirements. (Galwardi-Texas)
W72-13254

ADSORPTION OF INORGANIC COMPOUNDS BY ACTIVATED CARBON,
Westvaco Corp. Covington, Va.
E. A. Sigworth, and S. B. Smith.
Journal of the American Water Works Association, Vol. 64, No. 6, p. 386-391, June 1972, 1 fig., 5 tab., 6 ref.

Descriptors: *Water treatment, *Waste water treatment, *Public health, Sanitary engineering, *Adsorption, *Toxins, *Activated carbon, *Inorganic compounds.
Identifiers: *Trace metals.

The merits of activated carbon for removal of organic compounds from water have been well documented, but the potential for adsorption of inorganic compounds has received very little publicity. Studies published have generally been made on industrial water concentrations rather than the dilute concentrations ordinarily encountered in water supply. It is much more difficult to adsorb the low concentrations of materials. It is necessary to remove only very small amounts to eliminate the hazards. Information is presented from published literature, laboratory studies of the Westvaco Corp., and a two-year study by the Colorado School of Mines. Laboratory test results and/or educated guesses as to adsorbability are reported for individual items. Some metals having high to good carbon adsorption potential are antimony, arsenic, bismuth, chromium (Hexavalent C 96), tin, silver, mercury, cobalt and zirconium. Metals of fair to good adsorption potential are lead, nickel, titanium, vanadium and iron. Metals of low or unknown carbon adsorption potential include copper, cadmium, zinc, beryllium, barium, selenium, molybdenum, manganese and tungsten. Other items mentioned are phosphorus, free halogens and halides. (Bean-AWWARF)
W72-13260

EFFECT OF FOREIGN COMPONENTS ON THE PRECIPITATION OF PHOSPHATE BY ALUMINUM,
Rutgers - The State Univ., New Brunswick, N.J.
Wen Lin Yuan, and Pa Ho Hsu.
Paper presented at the 5th International Water Pollution Research Conference, July-August 1970, Published by Pergamon Press Ltd. Spring 1971, p I-16/1--I-16/12. 12 p, 8 tab, 13 ref. OWRR A-031-NJ (1).

Descriptors: *Phosphates, *Chemical precipitation, *Aluminum, *Waste water treatment, Water treatment, Nutrient removal, *Coagulation.
Identifiers: Aluminum phosphate.

A hydroxy-aluminum solution of NaOH/Al mole ratio = 2.6 was mixed with phosphate under a variety of conditions. It was found that the effectiveness of hydroxy-aluminum polymers to precipitate phosphate was greatly influenced by the ratio of phosphate to aluminum and also by the nature and concentration of foreign components present. Solution pH was found not to be a reliable criterion for controlling phosphate precipitation but the optimum pH varied with the nature and concentration of foreign components present. The results suggest that the diverse effects indicated by various foreign components are attributable to the following two mechanisms of opposing effects: (a) Foreign components, when added to a partially phosphated aluminum polymers, tend to neutralize the residual positive charge on the polymers and thus, precipitate both phosphate and aluminum together; and (b) these components can also compete against phosphate in reacting with hydroxy-aluminum polymers, thereby reducing the effectiveness of phosphate precipitation. It is thus concluded that the composition of the waste water to be treated and that of coagulants used must be taken into consideration in any laboratory study or practical process of phosphate removal.
W72-13290

DISINFECTION OF SEWAGE FROM ANTITUBERCULOUS DEPARTMENTS OF THE HEALTH SERVICE IN THE LIGHT OF LATEST RESEARCH,
State Inst. of Hygiene, Warsaw (Poland).
W. Dozanska.
Biul Suzby Sanit Epidemiol Wojewodztwa Katowickiego. Vol 15, No 1, p 101-107. 1971.
Identifiers: *Sewage treatment, *Waste water treatment, Chlorination, *Disinfection, Public health, Heat, Light, Sewage, Tubercle bacilli.

Neutralization and disposal of sewage contaminated with tubercle bacilli has been enforced under provisions of a regulation issued in June 1962. Sewage should be subjected to preliminary mechanical and biological treatment followed by disinfection. Chlorination or heat treatment are practiced. The thermal method is more reliable but costly.--Copyright 1972, Biological Abstracts, Inc.
W72-13317

SPRAY POND MATHEMATICAL MODEL FOR COOLING FRESH WATER AND BRINE,
Oklahoma State University, Stillwater. Dept. of Mechanical Engineering.
A. M. Elgawhary, and A. M. Rowe.
(1971). 8 p, 8 fig, 15 ref. OWRR A-019-OKLA (2).

Descriptors: *Cooling, *Heated water, *Mathematical models, *Ponds, Evaporation, *Thermal pollution.

Spray ponds are a proposed method for reducing the effects of thermal pollution. A mathematical model that simulates the cooling and evaporating process of spray cooling ponds is presented for fresh water and brine. Model predictions compared favorably with published data. Using the model, spray pond performance curves were generated for different nozzle diameters, various wind velocities, 3 staged freshwater ponds, brine at various salt concentrations and a comparison of fresh and salt water staged ponds. Model predictions found that increasing the wind velocity increased the cooling range, NaCl in water droplets increased cooling, and reducing droplet diameter increased the cooling range. The model is viewed as a useful tool in solving spray pond problems and the curves are presented as an aid to engineers considering spray ponds for thermal pollution control. (Bass-Vanderbilt)
W72-13320

UP COOLING TOWER CAPACITY WITHOUT ADDING NEW CELLS,
Phelps Engineering Co., Kentfield, Calif.
P. M. Phelps.
Heating, Piping, and Air Conditioning, p 82-84, March 1971. 4 fig, 1 tab.

Descriptors: *Cooling towers, Heated water, Water cooling, Electric powerplants, *Design.
Identifiers: *Increased capacity, Corrugated fill, Air velocity, Crossflow, Counterflow.

It is desirable to be able to add to cooling tower capacity without installing more cells to avoid problems with space, weight, wiring, noise, and aesthetics. Replacing the conventional wood lath fill with thin wall corrugated fill can significantly improve performance. This is particularly true in small towers. A design was developed to take advantage of the available volume in larger cooling towers. Crossflow cooling sections are installed along the sides of the tower. A space is left below the crossflow packing of sufficient height to permit passage of a predetermined amount of ambient air to the inner portion of the tower, which is filled with counterflow packing. This configuration develops a much greater volume of narrow packed sections than would be possible if the packing were installed in a counterflow or a crossflow plane only. Increases in mechanical equipment sizes are possible since the fan is set to give a higher air volume and a lower air velocity through the packing. This design method results in lower drift losses because of lower velocity. An example is described, giving methods of increasing capacity up to 250 percent. (Eagle-Vanderbilt)
W72-13325

WASTE HEAT USES CUT THERMAL POLLUTION,
Oak Ridge National Lab., Tenn.
S. E. Beall, Jr.
Mechanical Engineering, p 15-19, July 1971. 3 fig, 3 tab, 4 ref.

Descriptors: *Beneficial use, *Heated water, *Water reuse, *Electric powerplants, *Thermal pollution, Cities, Rural areas, Heating, Air conditioning, Evaporation, Water reuse, Greenhouses, Poultry, Aquiculture, Irrigation.

A combination of uses of heat from steam-electric power stations could consume a large fraction, if not all, of the heat normally wasted. Both urban and rural sites offer opportunities for applying low-temperature heat to useful purposes. The Department of Housing and Urban Development concluded that 300 to 380 F steam or hot water from a 500 Mwe plant can be competitive with present heat sources if the power plant is within 10 miles of the heat distribution point. In most U.S. cities, more heat can be used for air cooling during the crucial (from a thermal pollution standpoint) summer period than is needed for residential and commercial wintertime heating. Waste water sent through a vertical-tube evaporator can have the

dissolved solids content lowered. With proper treatment, this water can be reused. Heating and cooling of greenhouses and poultry houses and/or heating of aqua-culture ponds are constant, profitable uses of waste heat. Studies have shown the possibilities of using warm water effluents for growing algae and increasing yields of fish, oysters, lobsters, and shrimp. In Eugene, Oregon, irrigation with water as hot as 104 F is being studied. (Eagle-Vanderbilt)
W72-13329

WASTE HEAT DISPOSAL IN POWER PLANTS,
Federal Power Commission, Washington, D.C.
R. M. Jimeson, and G. G. Adkins.
Chemical Engineering Progress, Vol 67, No 7, p 64-69, July 1971. 6 fig, 2 photos, 4 tab.

Descriptors: *Thermal pollution, *Electric powerplants, *Future planning (Projected), Projections, Energy loss, Energy dissipation, Nuclear powerplants, Cooling, Cooling towers, Cooling water, Heated water, Consumptive use, Costs, Water quality standards.
Identifiers: *Waste heat disposal.

From National Power Survey studies, it is predicted that the generating capacity of electric powerplants in the U.S. will quadruple between 1970 and 1990. Nuclear power is expected to increase in amount of total capacity from less than 2% to nearly 40%. Although the percentage of fossil fueled steam-electric plants will decline, the amount of their capacity will double by 1990. In fossil-fueled plants, about 50% of the heat input is discharged through the condensers as waste heat. The figure for nuclear plants is 70%. The total estimated waste heat for 1990 is 40% greater than the B.T.U. equivalent of the electric generation in that year by all types of generating plants. Methods of waste heat disposal now in use are once through cooling, cooling ponds, wet cooling towers and dry cooling towers. The consumptive use of water is negligible for dry cooling towers and increases from once through cooling to cooling ponds to wet cooling towers. Cost ranges for each type of system are presented. Possible effects of thermal pollution are summarized. It is concluded that no single temperature standard could be applied to the country as a whole, or even to one state. (Eagle-Vanderbilt)
W72-13330

WATER POLLUTION: DISPOSAL AND REUSE, VOLS. 1 AND 2,
J. E. Zajic.
Marcel Dekker, Inc.: New York, N.Y., 389p. (Vol 1), 648p. (Vol 2), 1971, Pr. $22.75.
Identifiers: *Waste water treatment, *Water treatment, Algae, Biological treatment, Chemicals, Control, Disposal, Microorganisms, Parameters, Plants, Water pollution, Water reuse.

This book, in 2 vols., was designed as a text book for a course in water pollution engineering but will be of interest to anyone interested in water and its purification. Following an introduction on water quality, chemical and biological parameters and terminology, the approach to waste water treatment is divided into the biological and the chemical approach. The topics include: aquatic plant and algae control, filtration, solid waste disposal, biodegradation, electrodialysis, freezing and thawing, solvent extraction and sterilization and disinfection. Tables, graphs and diagrams are found throughout and each chapter ends with a list of references. At the end of vol. 2, an author index is found as well as a microorganism index.--Copyright 1972, Biological Abstracts, Inc.
W72-13335

INTERACTIVE COMPUTING IN WATER QUALITY MANAGEMENT,
Wisconsin Univ., Madison. Water Resources Center.
For primary bibliographic entry see Field 06A.
W72-13357

URBAN WASTES MANAGEMENT,
Rutgers - The State Univ., New Brunswick, N. J. Coll. of Agriculture and Environmental Science.
For primary bibliographic entry see Field 05G.
W72-13396

ANIMAL WASTE MANAGEMENT: PROBLEMS AND GUIDELINES FOR SOLUTIONS,
Cornell Univ., Ithaca, N.Y. Dept. of Civil and Agricultural Engineering.
For primary bibliographic entry see Field 05G.
W72-13424

A COASTAL POLLUTION PROBLEM AND ITS SOLUTION - THE DESIGN AND CONSTRUCTION OF A SUBMARINE SEWER OUTFALL AT EASTBOURNE,
F. L. Terrett.
Journal of the Institution of Public Health Engineers, Vol LXX, No 4, p 237-262, October 1971. 6 fig.

Descriptors: *Coasts, *Outfall sewers, *Pollution abatement, *Sanitary engineering, *Conveyance structures, Water pollution control, Municipal wastes, Conduits, Sewage effluents, Analytical methods, Design standards.
Identifiers: *England, *Eastbourne.

A study was initiated to determine if sewage discharge at Langley Point resulted in pollution of beaches at Eastbourne and Pevensey Bay, and the measures necessary to eliminate any such problem found. Float patterns and bacteriological tests indicated the presence of a pollution problem. Further oceanographic and geologic surveys accompanied by seasonal capacity studies resulted in the design of a submarine outfall and a pumping station capable of 28,000 gallons per minute peak flow, with a potential of 30% increase in capacity included in the design. (Ensign-PAI)
W72-13485

RECLAIMING USED CHERRY BRINES,
Oregon Agricultural Experiment Station, Corvallis.
D. V. Beavers, C. H. Payne, M. R. Soderquist, K. I. Hildrum, and R. F. Cain.
Journal Water Pollution Control Federation, Vol 42, No 6, June 1970, p 3-19. 7 fig, 5 tab, 20 ref.

Descriptors: *Reclaimed water, *Water reuse, *Industrial wastes, *Activated carbon, Pilot plants, Performance, Cost comparisons, Food processing industry, *Brines.
Identifiers: *Sweet cherry brine, Dissolved pigments, Cost savings.

Brines used for bleaching, curing, and preserving sweet cherries were made re-usable by treatment with activated carbon. Re-use required the removal of dissolved pigment in the used brine. Results from pilot plant tests showed that dissolved pigments were reduced from 41.7 mg/l to 0.047 mg/l. During this treatment the concentration of sulfur dioxide decreased only 26 ppm, the soluble solids decreased only 0.17 percent, and the pH increased only 0.09. Cherries packed in the reclaimed brine were of higher quality than those used in the control. It appeared that the brine could be reclaimed and re-used several times. Savings would result not only from lower requirements of chemicals for making brine, but also from reduced sewerage charges when discharging into a municipal sewerage system. (Galwardi-Texas)
W72-13490

CONTINUOUS BUBBLE FRACTIONATION PROCESS,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Civil Engineering.
L. K. P. Wang.
Ph. D. Dissertation, May 1972. 171 p, 57 fig, 9 tab, 135 ref. OWRR A-015-NJ (2).

Descriptors: *Surfactants, *Pre-treatment (Water), *Waste water treatment, Flow rates, Performance, Laboratory tests, Alkylbenzene sulfonates, *Distillation.
Identifiers: *Bubble fractionation column, Column diameter, Column height, Feed concentration, Continuous multi-column operation.

The performance of a bubble fractionation column was investigated experimentally using liquid flow rates, gas flow rate, feed material, feed concentration, feed location, column diameter and column height as variables. Surfactants tested were crystal violet chloride, methylene blue, nigrosin, branched-chain alkyl benzene sulfonate, linear alkylate sulfonate, lignosfulphonate and kraft lignin. Increasing the gas flow rate increased the effectiveness of the system. An increase in column diameter greatly increased the axial mixing and thereby diminished the concentration gradient in the column and the degree of separation. The adverse transfer of the solute by the eddy diffusion from top to bottom was found to be the factor that was limiting the effectiveness of the system. Maximum separation was obtained when all of the liquid from bursting bubbles was removed from the surface. Column height had very little effect on separation for the continuous system. Experimental results also indicated that feed location at the top was better than at the bottom. Continuous single-column operation gave only partial separation of surface active solute from its bulk solution; but continuous multicolumn operation gave a higher degree of separation. (Galwardi-Texas)
W72-13491

EFFECTS OF EXPOSING SLIMES ON ROTATING DISCS TO ATMOSPHERES ENRICHED WITH OXYGEN,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Environmental Sciences.
W. Torpey, H. Heukelekian, A. J. Kaplovsky, and L. Epstein.
Preprint, presented at 6th International Water Pollution Research Conference, Session 1, Hall B, Paper No 1, June 19, 1972. 11 p, 3 fig, 3 tab, 2 ref.

Descriptors: *Waste water treatment, *Oxygen, *Slime, Biochemical oxygen demand, Nitrification, Performance, Efficiencies, Pilot plants.
Identifiers: *Rotating disc, Contact time, Stage operation.

The results of operating a 41,635 liter per day staged rotating disk pilot plant were presented for 3 modes of operation, namely, (1) the slimes in all stages exposed to ambient atmospheres, (2) the slimes in stage 1 exposed to oxygen enrichment, and (3) the slimes in stages 1 and 3 of a 3-stage operation exposed to oxygen enrichment. The first mode of operation, about 30 minutes of contact with the slimes, was sufficient to remove 90% of the BOD5 whereas the second mode of operation, 18 minutes, accomplished the same rate of removal of BOD5. In the third mode, not only was 90% of the BOD5 removed during 17 minutes of contact with the slimes but a substantial portion of the nitrogenous demand was satisfied. Nitrification normally proceeded at a rate of 22 mg/l per hour of contact with the slimes. However, during the third mode of operation, nitrification proceeded at a rate of 76 mg/l per hour of contact. (Galwardi-Texas)
W72-13492

USING ACID BLEACH EFFLUENT FOR DISINFECTING DOMESTIC SEWAGE,
Rust Engineering Co., Pittsburgh, Pa. Environmental Control Div.
D. A. Spence.
Journal of Technical Association of Pulp and Paper Industry, Vol 52, No 11, November 1969, p 2100-2102. 1 fig, 1 tab, 3 ref.

Descriptors: *Sewage treatment, *Disinfection, *Chlorine, *Pulp wastes, Coliforms, Performance, Efficiencies, Effluents, Economic feasibility, *Waste water treatment.
Identifiers: *Acid bleach effluent, Pulp bleaching operation, Residual chlorine.

The feasibility of using the untreated acid effluent from a pulp bleaching operation to disinfect domestic sewage was investigated to determine whether the use of chlorine compounds could be replaced by the acid waste at a cost savings. Laboratory tests were performed in which the ratio of domestic sewage to acid effluent was varied from a low ratio of 0.05/1.0, to a high of 0.93/1.0. After a specified contact time, residual chlorine tests were run on the combined wastes, and coliform counts were determined. Coliform hills in excess of 99.99% were obtained at a chlorine residual of 1 mg/l after a 15 minute contact period. A survey of 34 bleached kraft mills throughout the United States showed that the average residual chlorine concentration in their acid effluents was 88 mg/l. (Galwardi-Texas)
W72-13493

LIQUID MEMBRANES CLEAN WASTE WATER.

Chemical Engineering News, Vol 49, p 30, June 7, 1971.

Descriptors: *Waste water treatment, *Membrane processes, *Oil-water interfaces, Solvents, Films, Emulsions, Drops (Fluid), *Oil wastes.
Identifiers: *Refinery wastes, Liquid membranes, Saponin.

Permeable liquid membranes can be used to selectively remove contaminants from refinery effluents. Development of separation by liquid membranes resulted from the observation that saponin, a natural surfactant, forms very strong films at oil-water interfaces. By forming droplets surrounded by membranes and passing them through a solvent, contaminants in the droplets can be selectively removed. In wastewater treatment, the membrane material is used to produce an emulsion of solvent droplets. The droplets are mixed with waste water where contaminants selectively permeate the film. The emulsion phase is de-emulsified and conditioned for re-use. (Galwardi-Texas)
W72-13497

PULLING EFFLUENTS INTO LINE.

Chemical Engineering, Vol 78, No 16, p 40, July 12, 1971. 1 fig.

Descriptors: *Treatment facilities, *Industrial wastes, Oxidation ponds, Aeration, Performance, Biochemical oxygen demand, Chemical oxygen demand, Phenols, Cost comparison, Activated sludge, *Capital costs, *Operating costs, Oil wastes, *Waste water treatment.
Identifiers: *Refinery wastes, Fluoride removal, Mechanical aeration.

A semi-continuous fluoride-removal system and the conversion of stabilization ponds to mechanically aerated lagoons have provided Texas City Refining, Inc., with a flexible up-to-date waste water treatment system. The former has cut fluorides from 45 mg/l to around 8 mg/l, and the latter discharges an effluent with less than 20 mg/l BOD5, 150 mg/l COD and about 0.2 mg/l phenol. Capital costs totaled just over $100,000 while a conventional activated sludge unit, by comparison, would have cost approximately $250,000. Operating costs were estimated at $16,000/yr or approximately $0.04/1000 gallons of waste water treated. The use of a lime slurry, instead of bag lime, to treat hydrofluoric and blowdown has reduced lime costs by 75%. (Galwardi-Texas)
W72-13498

RESIDUAL TAR DISPOSAL.

Chemical and Process Engineering, p 11, March 1971.

Descriptors: *Incineration, *Industrial wastes, *Chemical wastes, Settling basins, Liquid wastes, *Waste disposal, *Waste water treatment.
Identifiers: Phenol production, *Residual tar, England.

An incinerator designed to work con.inuously was installed at BP Chemical's Grangemouth site for disposing of the residual tar fraction from a new 40,000 ton/day phenol plant. Residual tar from the phenol plant is first blended with other fluid residues in a storage tank to the required viscosity for good combustion and then passed to the incinerator. Two burner stations each rated to pass up to 1500 lb/hr were provided. The main furnace has a 1,800 cu ft. capacity and a minimum firing rate of 10,000 BTU/cu ft/hr and a maximum firing rate of 30,000 BTU/cu ft/hr. A large settling basin was provided for water used in air pollution control. (Galwardi-Texas)
W72-13499

OXYGEN TRANSFER AND UTILIZATION IN HIGH SOLIDS MICROBIAL SYSTEMS,
Rensselaer Polytechnic Inst., Blacksburg, Va.
R. C. Stiefel.
Available from University Microfilms, Ann Arbor, Michigan, Order No. 68-6990, microfilm $3.00, Xeroxcopy $9.90. Ph. D. Dissertation, 1967. 216 p.

Descriptors: *Oxygen requirements, *Dissolved oxygen, *Activated sludge, *Mixing, Reynolds number, Impellers, Time, Pressure, Laboratory tests, Laboratory equipment, Performance, *Waste water treatment.
Identifiers: Volatile suspended solids, Oxygen transfer, Power requirements, Oxygen transfer coefficient.

The factors involved in the transfer and utilization of oxygen in high solids microbial systems that are capable of treating concentrated organic wastes were investigated. Four culture fluids with volatile suspended solids levels that ranged from 12.5 to 50 grams per liter were used in the determinations. The rates at which oxygen was transferred to the culture fluids were determined at pressures of one, three and five atmospheres, and at impeller speeds of 469, 704, 940, and 1,175 rpm. The power requirements to rotate the impeller at these speeds in the culture fluid were monitored. The oxygen utilization rate was determined by measuring the decrease in the dissolved oxygen level as a function of time after the aeration and agitation had been halted. The respiratory action in the culture fluid was chemically inhibited, and the rate at which oxygen was transferred to the fluid was determined by measuring the increase in the dissolved oxygen concentration as a function of time. The results indicated that the overall transfer coefficient and the rates at which oxygen was transferred to both the culture fluid and the fluid were all dependent on the Reynolds number. The rates were also proportional to the operating pressure. (Galwardi-Texas)
W72-13500

WASTE MANAGEMENT, TREATMENT AND DISPOSAL FOR THE FOOD PROCESSING INDUSTRY,
Pennsylvania State Univ., University Park. Coll. of Agriculture.
N. H. Wooding, Jr.
Special Circular 113, 1968. 28 p, 1 fig.

Descriptors: *Waste water treatment, *Waste disposal, *Industrial wastes, *Solid wastes, *Liquid wastes, Waste storage, Equipment, Irrigation, Spraying, Biological treatment, Lagoons, Pennsylvania, *Food processing industry, Permits.
Identifiers: *Waste management, Discharge permits.

A comprehensive review of waste management, treatment and disposal methods for the food processing industry was presented. Fundamental principles of solid and liquid waste management were outlined. Topics included in solid waste management were: temporary storage, collection and removal equipment and methods of disposal. Basic principles of liquid waste management including primary, secondary, tertiary and quaternary of special treatment were examined. Also, methods of liquid waste disposal including stream discharge permits, discharge to municipal sewerage systems, spreading on land, sprinkler or spray irrigation and sewage lagoons were discussed. (Galwardi-Texas)
W72-13501

MERCURY REMOVED FROM WASTE EFFLUENT VIA ION EXCHANGE,
W. C. Gardiner, and F. Munoz.
Chemical Engineering, Vol 78, No 19, August 23, 1971, p 57-59. 1 fig, 1 tab.

Descriptors: *Ion exchange, *Waste water treatment, *Resins, *Byproducts, *Mercury, Industrial wastes, Performance, Capital costs, Brines, Efficiencies.
Identifiers: Regeneration, Product recovery, Mud-settler brine, Chlor-alkali plants.

A process developed by Osaka Soda, Ltd. for mercury removal and recovery from wastewater and mud-settler brine common to chlor-alkali plants was presented. The process used two ion-exchange resins, one of which was regenerable, and features a closed-loop resin regeneration system. The process was capable of reducing mercury concentration in the effluent to less than 5 ppb for inlet mercury concentration in wastewater averaging 20 ppm. Inlet concentrations of 50 to 4000 ppm in wastewater in brine settler mud were reduced to 0.1 ppm. Mercury levels were reduced to 0.1 to 0.15 ppm in the first step of the ion-exchange process and to less than 5 ppb in the second step. Resin beds utilized in the first step required regeneration approximately once per week with an inorganic salt solution which can be regenerated and recycled. Resins utilized in the second step must be replaced approximately every six months. Capital costs were $400,000 and $575,000 for 300 and 600 ton/day chlor-alkali plants. (Galwardi-Texas)
W72-13502

TREATMENT OF RINSE WATER FROM ELECTROCHEMICAL PROCESSES,
EFCO Ltd. (England).
H. Silman.
Metal Finishing, Vol 69, June 1971, p 62-66. 4 fig.

Descriptors: *Waste water treatment, *Chromium, *Chemical precipitation, *Ion exchange, Recirculated water, Water reuse, Water conservation.
Identifiers: *Electrochemical processes, Electroplating industry, Cyanide rinse waters, Integrated effluent treatment, Electrolytic processes.

Various methods of treatment of rinse water from electrochemical processes including chemical treatment, controlled recirculation, ion-exchange, electrolytic processes and integrated effluent treatment were presented. A package unit for cyanide and hexavalent chromium wastes utilizing chemical procedures was designed to convert up to 5 lbs of sodium cyanide per hour to carbon dioxide and nitrogen at a load of 30 gallons per minute by means of chlorine and caustic soda and to convert up to 10 lbs per hour of hexavalent chromium to the trivalent form by means of sulfur dioxide, followed by addition of caustic soda to precipitate chromium hydroxide. It was reported that 50 to 80% savings of water requirements could be realized by the controlled recirculation method. In integrated treatment, effluent treatment was combined with the rinsing operation itself. Work pieces were rinsed in a chemical rinse solution which destroys or precipitates the toxic cations or anions in the dragout solution which was followed by a normal water rinse. (Galwardi-Texas)
W72-13503

WASTEWATER UTILIZATION IN THE POTATO PROCESSING INDUSTRY,
Washington State Univ., Pullman. Coll. of Engineering Research Div.; and Washington State Univ., Pullman. Radioisotopes and Radiations Lab.
E. Hindin.
Washington State University, Circular 34, May 1970. 40 p, 9 fig, 12 tab, 4 ref.

Descriptors: *Water reuse, *Reclaimed water, *Industrial wastes, Potatoes, Surveys, Pollution abatement, Flow rates, Temperature, Hydrogen ion concentration, Conductivity, Alkalinity, Biochemical oxygen demand, Chemical oxygen demand, Bacteria, Phosphates, Nitrogen, Calcium, Sodium, Magnesium, Washington, *Food processing industry.
Identifiers: *Potato processing industry, Industrial survey.

The past twenty years has seen a phenomenal growth in the potato processing industry in the State of Washington. This growth has created a unique wastewater disposal problem. It was estimated that more than 3,500 million gallons of wastewater must be disposed of each year from the central Washington potato processing industry. A survey was made of the industry to determine the extent of the wastewater disposal problem. Water use and wastewater reuse studies were conducted at three processing plants whose major product was frozen French fried items. Wastewater characteristics of specific process lines were presented in tabular form for each plant. Parameters listed included: flow, temperature, pH, conductivity, alkalinity, solids, BOD, COD, carbohydrates, calcium, magnesium, sodium, phosphates, nitrogen and bacterial counts. A scheme for a more complete reuse of the wastewater in processing was proposed based on the in-plant investigations. (Galwardi-Texas)
W72-13505

TURBULENCE IN ORTHOKINETIC FLOCCULATION,
California Univ., Berkeley. Sanitary Engineering Research Lab.
Y. Argaman.
Available from University Microfilms, Ann Arbor, Michigan, Order No. 68-13,883, Microfilm $3.00, Xerox $9.00. Ph. D. Thesis, 1968. 218 p.

Descriptors: *Flocculation, *Turbulence flow, *Performance, Mathematical models, Laboratory tests, *Waste water treatment, Kinetics.
Identifiers: Continuous flow, Stirring devices, Residence time distribution, Energy spectrum, Velocity gradient, Power input.

The various physical parameters involved in the flocculation process, and particularly the effect of turbulence on flocculation kinetics were investigated. The theory developed showed that the physical parameters directly affecting the performance of a flocculation reactor were the residence time and its distribution, the total power input, and the energy spectrum of the turbulence field. Experimental verification of the proposed theory involved simultaneous measurements of the flocculation performance and turbulence characteristics in a continuous flow flocculation reactor. Results showed that at a given residence time the performance of a flocculation system increased with the rms velocity gradient until a maximum value was reached beyond which any further increase resulted in a decrease in performance due to excessive floc breakup. Also, the compartmentalization of a continuous flow system exerted a significant influence on the performance. A 'stake and stator' type stirrer performed better than a 'turbine' type stirrer under all conditions. (Galwardi-Texas)
W72-13506

MALTING EFFLUENTS,
Newcastle-upon-Tyne Univ. (England). Dept. of Civil Engineering.
P. G. G. Isaac.
Effluent and Water Treatment Journal, Vol 9, No 11, November 1969, p 597-603. 4 fig, 8 tab, 9 ref.

Descriptors: *Industrial wastes, *Waste water treatment, *Trickling filters, *Flow diagrams, Biological treatment, Organic loading, Biochemical oxygen demand, Activated sludge, Performance, Efficiencies, Total costs, Estimated costs, *Effluents, *Waste identification.
Identifiers: *Malting wastes, Pasveer ditch, Characteristics, Removal, England.

Characterization of effluents from the malting of barley was presented in tabular form showing a wide range of BOD5 levels. The BOD load was approximately 0.25 lb per bushel. Present treatment and disposal of malting effluents were discussed. Flow diagrams for biological filtration, both for single filtration with recirculation and alternating double filtration were presented. BOD removals ranged from 61 to 97%. The pasveer ditch, a modification of the activated sludge process was especially suitable for treating malting wastes if situated in a rural area. Average results showed a BOD removal from 1140 mg/l in the influent to 12 mg/l in the effluent. The total cost for the treatment plant was about 35,000 pounds. Estimated costs for the treatment and acceptance of malting wastes were presented in tabular form. (Galwardi-Texas)
W72-13507

PHOTOSYNTHETIC YIELDS AND BYPRODUCT RECOVERY FROM SEWAGE OXIDATION PONDS,
Asian Inst. of Tech., Bangkok (Thailand). Dept. of Environmental Engineering.
M. G. McGarry, C. D. Lin, and J. L. Merto.
Preprint, presented at 6th International Water Pollution Research Conference, Session 4, Hall C, Paper No. 7, June 20, 1972, p C/4/7/1-C/4/7/11. 6 fig, 2 tab, 17 ref.

Descriptors: *Oxidation ponds, *Algae, *Waste water treatment, *Byproducts, Mixing, Solar radiation, Organic loading, Diurnal distribution, Hydrogen ion concentration, Dissolved oxygen, Biochemical oxygen demand, Performance, Flocculation, Flotation, Economic feasibility, Costs, Estimated costs.
Identifiers: Alum, Recycling, Treatment costs, Asia.

Algal growth and sewage treatment under tropical conditions as affected by pond mixing, solar radiation and diurnal variations in pond loading were described. For mass algal culture, ponds should be thoroughly mixed daily and the mixing period limited in order to minimize turbidity. Different shading material over pond surfaces allowed a predetermined percentage of total incident radiation to reach each surface. Algal concentrations increased in a near linear fashion with radiation available. Effects of diurnal variations in pond loading and effluent removal required on pond characteristics were presented in tabular form. Normal pH, D.O., and alkalinity variations were exhibited by all ponds and filtered BOD's did not exceed 20 mg/l. Alum flocculation and downflow flotation were used to clarify the pond effluent and concentrate the algae. Aluminum recovery and recycling were investigated. The potential use of algae as a livestock feed was investigated. Estimates indicated that if sewage treatment costs were set against algae production, algae could be produced for approximately 26 cents/kg. (Galwardi-Texas)
W72-13508

CONTINUOUS AUTOMATIC CONTROL OF A BIOLOGICAL FILTRATION SYSTEM,
F. E. Long.
Effluent and Water Treatment Journal, Vol 9, No 7, July 1969, p 379-385. 5 fig.

Descriptors: *Waste water treatment, *Filtration, *Automatic control, *Biological treatment, *Trickling filters, Distribution systems, Treatment facilities, Penstocks, Valves, Pumps, Weirs.
Identifiers: Partial double filtration, Recirculation, United Kingdom.

The automatic control system for the biological filtration units of the 7.67 mgd Mitchell Laithes wastewater treatment plant was described. The biological filtration system consisted of two filter beds, the primary filter bed having a capacity of 9 mgd and the secondary filter having a capacity of 18 mgd. The system was designed for partial double filtration up to a primary flow of 18 mgd, and recirculation between 18 mgd and 27 mgd. The changeover from one system to the other was carried out automatically, with a return to partial double filtration when primary flow falls back to 18 mgd. The distribution chamber into which the primary tank effluent flows formed the basis of the whole control system. The distribution chamber has a motorized penstock which can be controlled to deliver any required flow of primary tank effluent to the primary filter bed. Any residual flow passes over side weirs into the lower cascade and so to the secondary filter bed. Three motorized valves were installed in the recirculation main from the secondary pump house and enable recirculated effluent to mix with primary tank effluent at various locations. (Galwardi-Texas)
W72-13509

MASS TRANSFER AND GROWTH KINETICS ON A SLIME LAYER, A SIMULATION OF THE TRICKLING FILTER,
Cornell Univ., Ithaca, N.Y.
W. J. Maier.
Available from University Microfilms, Ann Arbor, Michigan, Order No. 67-1422, Microfilm $3.00, Xerox $9.00. Ph. D. Dissertation, September 1966. 199 p.

Descriptors: *Trickling filters, *Mass transfer, *Slime, *Growth rates, *Model studies, Laboratory equipment, Laboratory tests, Temperature, Feeding rates, Microorganisms, Laminar flow, *Waste water treatment.
Identifiers: Slime layer thickness, Molecular diffusion, Eddy motion, Glucose, Flat surface model.

A simple physical model, in the form of a flat surface covered with biologically active slime was used to simulate and study the purification of sewage in trickling filters. It was shown that the liquid film was in laminar flow as it moved over the slime surface. Mass transfer to the slime was by molecular diffusion. Studies with glucose and

minerals showed that only the top surface of the slime was active in the purification process. Increasing the thickness of the slime layer above 0.048 cm has essentially no effect on glucose removal. Process variables including feed rate, glucose concentration and temperature showed that the mass transfer was rate limiting except at high feed concentrations, above 100 mg/l. A two-fold increase in glucose utilization was observed when the liquid film was agitated to enhance mass transfer by eddy motion. Results from the process variable study on the flat surface together with the measured growth rates in agitated batch reactors indicated that the maximum growth rate of the microorganisms was substantially greater than the rates observed on the flat surface where diffusion limits availability of nutrients. (Galwardi-Texas)
W72-13512

INTERACTION OF A FLOCCULANT SOL AND GRANULAR FILTER MEDIA,
Rensselaer Polytechnic Inst., Blacksburg, Va.
For primary bibliographic entry see Field 05F.
W72-13513

OPTIMIZATION OF PHOSPHORUS REMOVAL WITH LIME TREATMENT,
Kansas Univ., Lawrence.
L. A. Schmid.
Available from University Microfilms, Ann Arbor, Michigan, Order No. 68-17451, Microfilm $3.85, Xerox $13.50. Ph. D. Dissertation, 1968. 300 p.

Descriptors: *Waste water treatment, Biological treatment, *Phosphorus, *Lime, *Activated sludge, *Municipal wastes, Chemical precipitation, Hydrogen ion concentration, Chemical oxygen demand, Performance, Vacuum drying, Estimated costs, Capital costs, Operating costs, Laboratory tests.
Identifiers: Phosphorus removal, Anionic polymers, Suspended solids.

A combination chemical and biological treatment method for the removal of phosphorus from sewage consisting of lime treatment followed by a high rate completely mixed activated sludge process was developed. The addition of 150 mg/l calcium hydroxide to raw sewage resulted generally in a pH of 9.5, phosphate removals of 80%, COD removals of about 60% and suspended solids removals of 90%. The lime system resulted in a total sludge production of less than 1.5 times the conventional production. The chemical and waste activated sludge was vacuum filtered very easily and economically with the aid of anionic polymers. The total net cost of removing 90% or more of the total phosphorus from a domestic sewage, including both capital and operating costs was estimated at $2.50/million gallons of flow for a 10MGD plant. (Galwardi-Texas)
W72-13514

THE USE OF COMPARTMENTALIZATION ANALYSIS TO STUDY CARBON TRANSFER RATE KINETICS IN PURE AND MIXED NON-STEADY STATE BIOLOGICAL ENVIRONS WITH APPLICATION TO ACTIVATED SLUDGE SYSTEMS,
Rensselaer Polytechnic Inst., Blacksburg, Va.
J. S. Anderson.
Available from University Microfilms, Ann Arbor, Michigan, Order No. 67-9271, Microfilm $3.60, Xerox $12.60. Ph. D. Dissertation, August 1966. 277 p.

Descriptors: *Biological treatment, *Activated sludge, *Carbon, Mathematical models, Kinetics, Radioisotopes, Laboratory tests, Growth rates, Microorganisms, Growth stages, *Waste water treatment.
Identifiers: Carbon utilization, Carbon-12, Carbon-14, Psuedomonas fluorescens.

A compartmentalization technique has been used to describe the variations of carbon with respect to time in a non-steady-state biological system. A Warburg system was used to simulate the non-steady-state system. Demands and contributions of carbon in the systems investigated were related to carbon transfer rates between the following 'carbon pools'. Specific substrate residual substrates, cell carbon, inorganics and the carbon dioxide evolved. This technique was tested with pure cultures of Pseudomonas fluorescens and mixed cultures from an activated sludge waste treatment system utilizing glutamic acid and glucose as their sole carbon source. Measurement of the two isotopes of carbon, i.e., C12 and C14 provided sufficient variables to enable mathematical analyses of the system using a series of linear differential equations. Calculated carbon transfer rates for each system were associated with specific coefficients within a proposed kinetic model for growth kinetics. (Galwardi-Texas)
W72-13515

FREEZE CONDITIONING OF WASTE ACTIVATED SLUDGE,
Alaska Univ., College. Environmental Health Engineering Program.
T. Tilsworth, R. S. Murphy, L. E. Garinger, and J. Wagner.
Alaska Institute of Water Resources Report (1972). 12 p, 7 fig, 2 tab, 11 ref. OWRR A-033-ALAS (1).

Descriptors: *Sludge treatment, *Freeze-thaw tests, *Dewatering, Depth, *Alaska, Capital costs, Operating costs, Estimated costs, Cost comparisons, Vacuum drying, Centrifugation, *Waste water treatment, *Activated sludge.
Identifiers: Natural refrigeration, Slow freezing, Sand drying beds.

The use of natural refrigeration for conditioning waste activated sludge by the freeze-thaw method was investigated. Freezing of the sludge substantially improved its settleability and dewatering characteristics. Slow freezing was more beneficial than fast freezing and improved efficiency was obtained with sludge having a solids content ranging from 1 to 2 percent. In College, Alaska, the maximum depth for freezing could be as much as 3 to 4 ft if an external heat source was provided to reduce the time of thawing. Because of the large land areas required, utilization would be limited to relatively small facilities having sufficient land in close proximity to the treatment plant. Capital and operating costs, based on a depth of 12 inches for freezing were estimated at $50 per ton of sludge as compared to $70 per ton using vacuum filtration or centrifugation and $100 per ton for sand drying beds. Waste activated sludge from extended aeration processes can be directly discharged to a sanitary landfill following freeze-thawing and dewatering. (Galwardi-Texas)
W72-13516

AEROBIC TREATMENT OF FEEDLOT RUNOFF,
Nebraska Univ., Lincoln. Dept. of Civil Engineering.
T. J. McGhee, R. L. Torrens, and R. J. Smaus.
Available from the National Technical Information Service as PB-211 902, $3.00 in paper copy, $0.95 in microfiche. Paper presented at Second Annual Environmental Engineering and Science Conference, April 20-21, 1972, Louisville, Kentucky. 18 p, 4 fig, 7 tab, 14 ref. OWRR A-022-NEB (2).

Descriptors: *Waste water treatment, *Activated sludge, *Aerobic treatment, Chemical oxygen demand, Retention, Time, Biochemical oxygen demand, Laboratory tests, Performance, Efficiencies, Color, Turbidity, Coagulation, *Feed lots, *Farm wastes.
Identifiers: *Feedlot runoff, *Extended aeration, Mixed liquor suspended solids.

The treatability of feedlot runoff was investigated utilizing an extended aeration type system. The operational parameters studied were evaluated on a basis of COD removal and the effects of the treatment system on the turbidity. Retention times were 8.0, 7.2, 4.4, 3.7, 2.0, and 1.0 days. COD reductions of 60% or more were obtained at retention times of three days or more and at MLSS values of 2,000 mg/l or more. Increased retention times resulted in increased COD reductions. The color of the runoff was affected only slightly by aerobic treatment regardless of the retention time. However, significant reductions were obtained by heavy dosages (2000-3000 mg/l) or iron and aluminum coagulants. COD analysis was superior to the BOD5 determination in evaluating the efficiency of treatment and the strength of feedlot runoff. (See also W72-13518 and W72-13519) (Galwardi-Texas)
W72-13517

AEROBIC TREATABILITY OF FEEDLOT RUNOFF,
Nebraska Univ, Lincoln.
R. L. Torrens.
MiSc Thesis, December 1971. 82 p, 15 fig, 9 tab.

Descriptors: *Waste water treatment, *Aerobic treatment, *Farm wastes, Biological treatment, *Feed lots, Chemical oxygen demand, Retention, Time, Biochemical oxygen demand, Laboratory tests.
Identifiers: *Feedlot runoff.

Laboratory aeration units were operated at liquid retention times of one to eight days in evaluating the feasibility of aerobic treatment of settled feedlot runoff. Routine analyses of the raw waste and treated effluent included BOD, COD, organic and ammoniz nitrogen, color and turbidity and dissolved and suspended solids. Oxygen uptake studies (BOD) were conducted for up to twenty days. Based upon the data obtained, the following conclusions were drawn: Aerobic systems can effectively treat feedlot runoff with COD reduction in excess of 60% at retention times of three days or more; the color of the runoff is affected only slightly by aerobic treatment regardless of the retention time; the effluent from the system is odorless and highly stable from a biological standpoint; and COD analysis is superior to the BOD determination in evaluating the strength of this waste. (See also W72-13517 and W72-13519).
W72-13518

AEROBIC TREATMENT OF FEEDLOT RUNOFF.
Nebraska Univ., Lincoln.

Available from the National Technical Information Service as PB-211 963, $3.00 in paper copy, $0.95 in microfiche. Nebraska Water Resources Research Institute Project Completion Report, June 1972. 16 p, 4 fig, 5 tab, 9 ref. OWRR A-022-NEB (5).

Descriptors: *Waste water treatment, *Aerobic treatment, *Farm wastes, *Feed lots, Biological treatment, Chemical oxygen demand, Rentior, Time, Biochemical oxygen demand, Laboratory tests.

Two laboratory aeration units were operated at liquid retention times ranging from one to eight days. Routine data acquired included BOD and COD of the raw and treated waste; influent, effluent and mixed liquor suspended solids; organic and ammonia nitrogen; mixed liquor dissolved oxygen and turbidity. BOD measurements were extended for periods of up to 20 days. Chemical coagulation studies were conducted to determine the efficiency of treatment and the required dosages of alum, ferric sulfate and ferric chloride. The conclusions drawn were: (1) Feedlot runoff may be effectively treated by an aerobic biological system with COD reductions in excess of 60 per-

cent at retention times of three days or more. (2) The color of the runoff is affected only slightly by aerobic treatment but may be reduced by up to 99 percent by heavy doses of iron or aluminum coagulants. (3) The standard five-day BOD test yields a deceptively low measurement of the oxygen demand of this waste. (See also W72-13517 and W72-13518)
W72-13519

WATER PURIFICATION PROCESS,
Standard Oil Co. of Indiana, Chicago, Ill. (assignee).
J. F. Grutsch, and G. C. Flood.
U. S. Patent No. 3,663,435, 2 p, 2 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 898, No 3, p 992, May 16, 1972.

Descriptors: *Patents, *Water purification, Aerated lagoons, Equipment, Pollution abatement, Separation techniques, Water pollution, Water pollution treatment, *Waste water treatment.

A process is described for removing floating matter from the surface of a bioflotation lagoon. Floating barriers confine the matter to the upstream end of the lagoon. Conventional stationary aerators at that end beat air onto the lagoon's surface. This generates surface currents which carry the floating matter towards the skimmers. (Sinha-OEIS)
W72-13520

DEVICE FOR ELECTROLYTICALLY INDUCING FLOCCULATION FOR WATER TREATMENT PLANTS,
Westinghouse Electric Corp., Pittsburgh, Pa. (assignee).
A. R. Marmo.
U. S. Patent No. 3,663,413, 2 p, 2 fig, 1 ref; Official Gazette of the United States Patent Office, Vol 898, No 3, p 987, May 16, 1972.

Descriptors: *Patents, *Waste water treatment, Treatment facilities, Pollution abatement, Flocculation, Aeration, *Electrodes, *Alkalis, Treatment facilities.
Identifiers: Metallic hydroxides.

Sacrificial electrodes are suspended in an aeration tank above air diffusers. The electrodes produce metallic hydroxides in solution and these act as flocculating agents. The air diffusers keep the electrodes clean and help to mix the hydroxides with the sewage particles. (Sinha-OEIS)
W72-13521

APPARATUS FOR IRRADIATING A LIQUID,
Controlex Corp. of America, Croton Falls, N.Y.
A. J. Kompanek.
U. S. Patent No. 3,659,096, 6 p, 6 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 897, No 4, p 1438, April 25, 1972.

Descriptors: *Patents, Equipment, *Irradiation, *Oxidation, *Ultraviolet radiation, *Ozone, Biochemical oxygen demand, *Sewage treatment, *Waste water treatment, Radiation.

The stream of liquid is separated from the radiation source by a gaseous atmosphere such as air or oxygen. The liquid is contacted with radiation from an ionizing radiation source. Since the liquid is maintained as a thin layer, the effectiveness is enhanced to the point where less radiation intensity is required. The air or oxygen between the liquid and the radiation source is converted into ozone, at least in the presence of ultra-violet radiation. Thus are means provided for oxidizing organic molecules. The presence of oxygen can also supply a portion of the BOD of the liquid passing through the apparatus in the case of a disinfecting or sewage treating operation. (Sinha-OEIS)
W72-13523

METHOD FOR CONTROLLING AND INHIBITING THE FORMATION AND GROWTH OF SLIME IN INDUSTRIAL WATER SYSTEMS,
Muck and Co., Inc., Rahway, N.J. (assignee).
S. J. Lederer.
U. S. Patent No. 3,658,700, 4 p, 8 ref; Official Gazette of the United States Patent Office, Vol 897, No 4, p 1367, April 25, 1972.

Descriptors: *Patents, *Paper and pulp industry, *Slime, *Water pollution control, *Waste water treatment.
Identifiers: Benzyl bromoacetate, Paper mills, Antibacterial action, Antifungal action.

The method of controlling and inhibiting formation of slime in paper mill white water systems consists of adding benzyl bromoacetate in amounts from 0.1 to 25.0 ppm. Both the antibacterial and antifungal activity are illustrated by the experimental results included. (Sinha-OEIS)
W72-13524

METHOD FOR SEPARATING LIQUID FROM SOLID SUBSTANCES AND STORING THE SOLID SUBSTANCES,
Brown, Boveri and Co. Ltd., Baden (Switzerland).
G. Baumann, and G. Hentschel.
U. S. Patent No. 3,658,179, 3 p, 2 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 897, No 4, p 1251, April 25, 1972.

Descriptors: *Patents, *Filtration, *Radioactive waste disposal, *Ion exchange, *Resins, *Waste water treatment.

The apparatus consists of a container whose top side is at least partly open but can be sealed tightly and which is equipped for filtering and storage. There is also a filter for separating the liquid from the solids. The filter is arranged in the vessel so that the bottom of the vessel remains partly free for collecting the liquid and removing it. In use in connection with a nuclear power plant, the retained solids remain within the vessel which is subsequently sealed for storage. (Sinha-OEIS)
W72-13525

METHOD AND APPARATUS FOR RETAINING AND DISLODGING FILTER CAKE,
Sparkler Mfg. Co., Conroe Tex. (assignee).
A. C. Kracklauer.
U. S. Patent No. 3,655,049, 4 p, 5 fig, 1 ref; Official Gazette of the United States Patent Office, Vol 897, No 2, p 499, April 11, 1972.

Descriptors: *Patents, *Filtration, Equipment, *Waste water treatment, Treatment, Pollution abatement, Separation techniques, Filters.
Identifiers: *Filter cake.

In a filtration apparatus, the filter cake may be retained on a vertical filter plate having flexible filtering media for filtering fluids until it becomes necessary to dislodge the cake. The method of dislodging includes oscillation of a screen located adjacent to the filter plate while at the same time expanding the filtering media toward the screen and washing the filtering media with water. (Sinha-OEIS)
W72-13526

REVERSE OSMOSIS SEPARATIONS USING A TREATED POLYAMIDE MEMBRANE,
Du Pont de Nemours (E. I.) and Co., Wilmington, Del.
For primary bibliographic entry see Field 03A.
W72-13527

LIQUID TRANSFER MEANS FOR SETTLING TANKS,
Carborundum Co., Niagara Fall, N.Y. (assignee).
D. E. Holloway.
U. S. Patent No. 3,550,783, 4 p, 6 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 881, No 5, p 1903, December 29, 1970.

Descriptors: *Patents, Water purification, *Equipment, *Settling basins, *Waste water treatment, Pollution abatement, Water pollution, Separation techniques.
Identifiers: *Settling tanks.

The removal of a large quantity of fluid at low velocity from a settling tank is described. A boxlike receiver is supported and suspended within the tank so that the sidewalls thereof extend above and below the top level of the liquid. There are several open ended tubes within the receiver and extending through the bottom of the receiver. The liquid rising in the settling tank flows to overflow at the top edges of the tubes into the receiver where it is released through its outlet. (Sinha-OEIS)
W72-13529

WASTE WATER RECLAMATION SYSTEM,
For primary bibliographic entry see Field 03D.
W72-13530

METHODS AND APPARATUS FOR DISPOSING OF WASTE MATERIALS,
Black Clawson Co., Hamilton, Ohio. (assignee).
J. W. Wiseman.
U. S. Patent No. 3,549,529, 3 p, 1 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 881, No 4, p 1558, Dec 22, 1970.

Descriptors: *Patents, Waste treatment, *Municipal wastes, *Organic wastes, *Oxidation, Sewage sludge, Sewage treatment, Separation techniques, Waste water treatment, Pollution abatement, Water pollution, *Chlorination.
Identifiers: *Wet oxidation.

Two disposal systems, one for sewage sludge and one for municipal refuse, are combined by transforming the solid constituents of each waste material into a mutually disposable form. The mechanical and hydraulic shearing actions of the pulper significantly retard decomposition and enhance wet oxidation by disintegrating the unstable cell walls of organic molecules under aeration conditions within an aqueous medium, consisting chiefly of water. The mixed slurry may be moved to the disposal device prior to the onset of organic decomposition. A final chlorination treatment is provided for. (Sinha-OEIS)
W72-13531

SEWAGE TREATMENT PROCESS AND SYSTEM,
Nayadic Sciences Inc., West Chester, Pa. (assignee).
J. I. Stevens.
U. S. Patent No. 3,549,521, 4 p, 1 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 881, No 4, p 1556, December 22, 1970.

Descriptors: *Patents, *Sewage treatment, *Waste water treatment, *Aeration, *Activated sludge, *Flow rates.

Raw sewage is fed to and passed serially through first stage and second stage treating units. Each unit has an aeration zone in which the sewage is mixed with air or oxygen to form an activated sludge and a clarification zone. The settled activated sludge from the first stage clarifying zone is collected, recirculated, and mixed with raw sewage being fed to the first stage aeration zone. The supernatant liquor from the first stage is fed into the second stage aeration zone. The supernatant liquor from the second stage clarification zone is discharged from the system. The flow rate analyzer is claimed as a special improvement in this invention. (Sinha-OEIS)
W72-13532

METHOD FOR THE TREATMENT OF GARBAGE AND OTHER WASTES,
Black Clawson Co., Hamilton, Ohio. (assignee).
J. Baxter, Jr.
U. S. Patent No. 3,549,092, 5 p, 6 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 881, No 4, p 1463, December 22, 1970.

Descriptors: *Patents, *Solid waste treatment, *Sewage treatment, *Municipal wastes, Pollution abatement, Equipment, Waste treatment, *Waste water treatment.
Identifiers: Pulpers, *Pulping.

Miscellaneous and unsorted municipal wastes are subjected to a pulping operation in an aqueous medium under conditions of mechanical and hydraulic action. When sewage is used as the pulping medium, it is possible to deliver the pulped and extracted waste slurry into the existing sewage system of the municipality for treatment with other sewage by conventional methods. (Sinha-OEIS)
W72-13533

APPARATUS FOR USE IN SLUDGE TREATMENT,
Passavant Werke (Germany). (assignee).
K. Theidel, and W. Weber.
U. S. Patent No. 3,549,017, 4 p, 4 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 881, No 4, p 1445, December 22, 1970.

Descriptors: *Patents, *Sludge treatment, Sewage sludge, *Sewage treatment, Equipment, Pollution abatement, Separation techniques, *Waste water treatment.

This sewage treatment apparatus comprises equipment for lifting and lowering sludge scraping or removal gear in a sludge thickener basin. The raising of the apparatus will be responsive to an increase in the resistive force offered by the accumulating sludge counteracting the force intended to turn the shaft. The motor is mounted on roller bearings to permit rotational movement. The outermost scraping blades and scraping rods are lifted out of contact with the solids while the full driving force is applied to the innermost blades. After time for clearing at the central area of the basin, a switch turns the motor in the opposite direction to lower the poles. This causes the sludge to be scraped from top to bottom and conveyed to the discharge hopper. (Sinha-OEIS)
W72-13534

PERMEABLE MEMBRANE AND METHOD OF MAKING AND USING THE SAME,
Amicon Corp., Cambridge, Mass. (assignee).
P. N. Rigopulos.
U. S. Patent No. 3,549,016, 6 p, 2 ref; Official Gazette of the United States Patent Office, Vol 881, No 4, p 1445, December 22, 1970.

Descriptors: *Patents, *Membranes, Permeability, *Water purification, Separation techniques, Water quality, Equipment.

An anisotropic permeable membrane consists of a gel structure having a lattice formed of two ionically associated synthetic organic linear polymers. Each polymer has sufficient dissociable groups to render it water-soluble in the absence of the other. The membrane has a zone adjacent one face of less permeability than the remainder of the membrane. By proper control of the composition of the casting solution and of the washing and annealing conditions, membranes may be produced having flow rates of the order of 50 to 175 gallons of distilled water per 24 hours square foot of membrane area at a pressure differential of 100 pounds per square inch across the membrane. (Sinha-OEIS)
W72-13535

METHODS AND APPARATUS FOR DISPOSING OF WASTE MATERIALS,
Black Clawson Co., Hamilton, Ohio. (assignee).
P. G. Marsh, and E. T. Blakley.
U. S. Patent No. 3,549,010, 5 p, 1 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 881, No 4, p 1444, December 22, 1970.

Descriptors: *Patents, *Aeration, *Flocculation, Sedimentation, *Sludge treatment, Activated sludge, *Industrial wastes, Municipal wastes, Pollution abatement, Waste treatment, *Waste water treatment, Sewage treatment, Separation techniques, Equipment, *Pulp wastes, *Waste disposal.

Waste sludges, particularly sludges resulting from the treatment of municipal sewage, but including industrial waste sludges, are mixed with the residue obtained by the pulping of garbage, trash and other municipal refuse. A pulper receives the solid waste and a continuous supply of fresh water for wash-up purposes. Waste is reduced to a slurry form. A primary sedimentation tank, an aeration tank, and a final sedimentation tank are provided. A line supplies compressed air to the liquid in the aeration tank to suppress anaerobic decomposition and to remove dissolved or suspended solids. The liquid is delivered to a final sedimentation tank where a flocculent precipitate (activated sludge) settles out to leave a clear, odorless effluent. Fibers are removed from the solid waste and are disposed separately. The sludge and slurry are processed for ultimate disposal. (Sinha-OEIS)
W72-13536

ADJUSTABLE PONTOONS FOR AERATOR PLATFORM,
R. D. Boutros.
U. S. Patent No. 3,548,770, 2 p, 5 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 881, No 4, p 1390, December 22, 1970.

Descriptors: *Patents, *Pontoons, *Aeration, Equipment, *Waste water treatment, Water pollution treatment, Water purification, Aerobic treatment, Pollution abatement.

The pontoon includes a hollow, oblong flotation shell filled with foamed resin material. A shaft is fixed to the shell and extends vertically upward. A horizontal support plate is carried by the shaft and a bearing plate is arranged on the platform to rest on the support plate. Slots in one of the plates follow a circle concentric with the shaft. Pins on the other plate extend through the slots to permit turning between the two plates concentric with the shaft. (Sinha-OEIS)
W72-13537

BIO-OXIDATION WITH LOW SLUDGE YIELD,
Union Carbide Corp., New York. (assignee).
J. R. McWhirter.
U. S. Patent No. 3,547,814, 8 p, 4 fig, 16 ref; Official Gazette of the United States Patent Office, Vol 881, No 3, p 1126, December 15, 1970.

Descriptors: *Patents, *Biochemical oxygen demand, *Activated sludge, Sludges, *Chemical wastes, *Municipal wastes, *Oxygenation, Separation techniques, Pollution abatement, Waste treatment plants, *Waste water treatment, Water pollution treatment, Water pollution.
Identifiers: Petrochemical plants, Paper plants.

Sufficient recycling sludge is introduced to the BOD containing water aeration zone to provide volatile suspended solids content of at least 3000 ppm. Oxygen- 50% by volume, is mixed in the aeration for a liquid solid contact time of at least 5 minutes. The DO content is maintained above 0.5 ppm and suspended activated sludge is formed. The activated sludge is then transferred to a stabilization zone where it is held for 20-90 minutes. Again gas, containing oxygen at least 35% by volume, is introduced. Finally at least part of the sludge derived from the oxygen gas mixing is withdrawn and returned to the BOD containing water aeration zone. (Sinha-OEIS)
W72-13538

APPARATUS AND METHOD FOR PURIFYING WASTE WATERS,
Aairbanks, Morse and Co., Chicago, Ill.
Pei Tai Pan.
U. S. Patent No. 3,547,800, 3 p, 2 fig, 11 ref; Official Gazette of the United States Patent Office, Vol. 881, No. 3, p 1123, December 15, 1970.

Descriptors: *Patents, *Waste water treatment, Sewage treatment, Sea water, *Chlorination, *Coagulation, *Permselective membranes, Electrolysis, Ion exchange.
Identifiers: Sodium hydroxide.

An apparatus is provided for simultaneously separating suspended and dissolved solids, in a raw sewage mixture, from the liquid fraction. The separated liquid effluent is treated in a flotation chamber by electrolytic coagulation and disinfection by chlorination. Ion exchange takes place in a pretreatment unit. A cation permselective membrane is used and NaOH solution is used for coagulation. Seawater may be used as the initial liquid fraction. (Sinha-OEIS)
W72-13540

APPARATUS FOR TREATING WASTE WATER ASSOCIATED WITH HYDROCARBON PRODUCTION,
Shell Oil Co., New York. (assignee)
L. L. Wilkerson.
U. S. Patent No. 3,547,190, 3 p, 1 fig, 8 ref; Official Gazette of the United States Patent Office, Vol. 881, No. 3, p 989, December 15, 1970.

Descriptors: *Patents, *Waste water treatment, *Hydrogen sulfide, Industrial wastes, Separation techniques, Pollution abatement, *Aeration, Water pollution, Water pollution treatment.
Identifiers: Hydrocarbon production.

An apparatus is provided for treatment of waste waters from hydrocarbon production. Concentration of hydrogen sulfide is reduced at the same time as the temperature of the water is reduced. The waste water is pumped under pressure to spray nozzles directed vertically into the atmosphere. The hydrogen sulfide escapes and the water is collected in a basin where skimming of any remaining oil may be accomplished. (Sinha-OEIS)
W72-13541

WASTE TREATMENT,
Ethyl Corp., New York. (assignee)
A. W. Busch.
U. S. Patent No. 3,546,111, 3 p, 1 fig, 4 ref; Official Gazette of the United States Patent Office, Vol. 881, No. 2, p 704, December 8, 1970.

Descriptors: *Patents, Waste treatment, *Waste water treatment, *Domestic wastes, *Organic wastes, *Trickling filters, Filters, Filtration, *Aeration, Lime, Phosphates, Carbon dioxide, Treatment, *Municipal wastes, *Biological treatment, Biochemical oxygen demand, Hydrogen ion concentration.

After comminution, the waste stream flows into the top of a chamber containing a biological trickling filter. Large voids in the plastic packing filter media provide a high flow of air to perpetuate the growth of the biological material. The treated fluid is collected in a basin underneath the plastic material. After secondary aeration if necessary, the treated fluid flows into a lime treatment vessel. The lime will precipitate inorganic salts, such as phosphates, magnesium, or calcium. Mechanical

devices are used to remove the precipitate as the cleaned fluid leaves. Carbon dioxide from the calciner stack gas is used to adjust the pH of the effluent before release. (Sinha-OEIS)
W72-13542

METHOD AND APPARATUS FOR TREATING SEWAGE WATER BY MEANS OF FLOCCULATION AND AERATION,
Stenberg-Flygt A.B., Solna (Sweden). (assignee)
S. Englesson, and S. G. Gamer.
U. S. Patent No. 3,546,110, 5 p, 2 fig, 4 ref; Official Gazette of the United States Patent Office, Vol. 881, No. 2, p 704, December 8, 1970.

Descriptors: *Patents, *Liquid wastes, *Sewage, *Flocculation, *Sedimentation, *Aeration, Separation techniques, Pollution abatement, Waste water, *Waste water treatment, Water pollution, Water pollution treatment, Treatment facilities, Water purification, *Phosphorus.

Sewage water is fed into a flocculation and sedimentation apparatus. As much as 20% by volume of regenerated sludge is added to the sewage. From 20 to 100 cubic m/hr of air is supplied from the bottom so that a laminar vertical flow of air bubbles rises upward through the sludge. Carbon dioxide and nitrogen are formed and expelled. Provisions are also made for precipitating phosphorus where necessary. This is done by adjusting the Fe (OH)3 concentration and maintaining a neutral pH. Details are given on the special equipment used. (Sinha-OEIS)
W72-13543

APPARATUS FOR PURIFYING LIQUIDS CARRYING SUSPENDED SOLID PARTICLES, CHIEFLY PULP FOR PAPER MILLS,
Etablissement d'Etudes et de Recherches Meteorologiques, Paris (France). (assignee)
J. P. Lamort.
U. S. Patent No. 3,545,621, 4 p, 6 fig, 4 ref; Official Gazette of the United States Patent Office, Vol. 881, No. 2, p 594, December 8, 1970.

Descriptors: *Patents, *Pulp wastes, *Water purification, *Waste water treatment, Separation techniques, *Equipment, *Rotors.

The apparatus includes a vat enclosing a cylindrical sieve and a bladed rotor. A second sieve is arranged in series with the first sieve coaxially with it. The bladed rotor produces pressure pulses on the upstream side of the first sieve and on the downstream side of the second sieve. The suspension is fed into the annular gap between the two coaxial sieves so as to flow both outward through the outer sieve and inward through the inner sieve. (Sinha-OEIS)
W72-13544

FILTER MEDIA,
J. M. Choun.
U. S. Patent No. 3,543,937, 4 p, 10 fig, 7 ref; Official Gazette of the United States Patent Office, Vol. 881, No. 1, p 178, December 1, 1970.

Descriptors: *Patents, *Liquid wastes, Sewage, *Organic wastes, Industrial wastes, *Filters, Filtration, Equipment, Pollution abatement, Waste water, *Waste water treatment, Water pollution, Water pollution treatment, Separation techniques.

Thin-walled shells, preferably spherical in form and made of selected synthetic resin are placed within a filter tank. The individual shells are perforated to permit percolation of water and air ventilation. As the waste water is sprayed onto the media, it percolates downward. It is exposed to the oxidizing action of aerobic microorganisms. The water collects in drains at the bottom of the tank and is removed through the main drainpipe. (Sinha-OEIS)
W72-13545

APPARATUS FOR EFFLUENT TREATMENT,
Simon-Carves Ltd., Stockport (England). (assignee)
J. W. Abson, and E. I. Clark.
U. S. Patent No. 3,543,936, 4 p, 3 fig, 7 ref; Official Gazette of the United States Patent Office, Vol. 881, No. 1, p 178, December 1, 1970.

Descriptors: *Patents, Effluents, Municipal wastes, *Industrial wastes, *Waste water treatment, *Electrodes, Equipment, Pollution abatement, Water pollution, Water pollution treatment.

Electrodes are immersed in the sludge. A potential difference is applied across the electrodes at a low current density sufficient to cause gassing. A thickened layer of sludge is formed and the remainder of the liquor is removed. Examples of successful use are presented. This apparatus comprises a tank in which is mounted along a base a horizontal planar aluminum cathode. In addition several vertical, parallel, planar, evenly-spaced, shallow, mild steel anodes are mounted in the tank. The anodes are suspended above the cathode by electrically conductive rods which are mounted in two spaced insulated supports. (Sinha-OEIS)
W72-13546

5E. Ultimate Disposal of Wastes

SANITARY LANDFILLS--A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.
For primary bibliographic entry see Field 05B.
W72-13043

MICROBIOLOGICAL UTILIZATION OF SULPHITE LIQUOR,
British Columbia Research Council Vancouver.
For primary bibliographic entry see Field 05D.
W72-13098

FERMENTATIVE UTILIZATION OF SPENT SULPHITE LIQUOR, A REVIEW AND PROPOSAL,
British Columbia Research Council Vancouver. Div. of Applied Biology.
For primary bibliographic entry see Field 05D.
W72-13107

RESIDUAL TAR DISPOSAL.
For primary bibliographic entry see Field 05D.
W72-13499

5F. Water Treatment and Quality Alteration

WATER SYSTEM AND TREATMENT HANDBOOK.
For primary bibliographic entry see Field 08B.
W72-13147

BACTERIA CAUSE MANY PROBLEMS.

Johnson Drillers' Journal, Vol 39, No 4, p 1-3, 13. Jul-Aug 1967.

Descriptors: *Water quality, Water pollution, *Coliforms, Bacteria, E. Coli, Chlorination, Water wells, *Water sampling, *Water treatment.
Identifiers: *Presumptive test, Dysentery, Oxyacetylene torch, Sodium hypochlorite.

Bacteria in water can present a health hazard, in that they can cause typhoid, dysentery, and other intestinal upsets. Disease-causing bacteria, testing and identification of these bacteria in water samples, disinfection of drilling water and equipment by means of chlorination, and screening of samples are described. The 'presumptive' test for coliform bacteria is outlined, and sampling methods are demonstrated. (Campbell-NWWA)
W72-13156

A BLISTER SHEET AND POUCH OVERWRAPPER PACKAGE FOR THE IODINE WATER PURIFICATION TABLET,
Columbia Research Corp., Gaithersburg, Md.
D. F. Brown, and C. T. Derick.
Available from the National Technical Information Service as AD-733 921, $3.00 in paper copy, $0.95 in microfiche. Army Land Warfare Laboratory, Technical Report No LWL-CR-05S69, Oct. 1971. 49 p, 26 fig, 3 tab, 11 ref, append. DAADO3-70-C-0089.

Descriptors: *Water treatment, *Public health, Sanitary engineering, *Iodine, *Disinfection, *Water purification.
Identifiers: Packaging, Iodine tablets.

Iodine tablets for use in disinfection of water contain a minimum of 7.6 mg of titratable iodine. They are packaged in glass bottles which provide little protection from moisture, once the bottle is opened. Often large percentages of the tablets are rendered impotent. Blister sheets for 12 tablets, and pouch overwrappers that contain two sheets were developed; each tablet is individually isolated in vacuum by heat sealing. The sheets are fluorohalocarbon, the overwrappers are Mylar-aluminum foil polyolefin. The background color matches the normal tablet color, therefore, deterioration of tablets is evident by color changes from normal gray through olive-drab and finally to yellow and orange. The yellow tablets contain 7.6 mg of titratable iodine but they take longer to dissolve, and they can be eliminated. Test exposure to humidity demonstrated the ability of the package to protect the tablets to the objective of two-year shelf life when sealed in the overwrappers, and six months when the overwrapper is opened. Sheets, overwrappers, methods and test procedures are described. It is predicted that in mass production costs could be comparable to the present cost in bottles. (Bean-AWWARF)
W72-13257

DRINKING WATER STANDARDS, 1961, US PUBLIC HEALTH SERVICE.
Public Health Service, Washington, D.C.
For primary bibliographic entry see Field 05G.
W72-13258

ADSORPTION OF INORGANIC COMPOUNDS BY ACTIVATED CARBON,
Westvaco Corp. Covington, Va.
For primary bibliographic entry see Field 05D.
W72-13260

EFFECT OF FOREIGN COMPONENTS ON THE PRECIPITATION OF PHOSPHATE BY ALUMINUM,
Rutgers - The State Univ., New Brunswick, N.J.
For primary bibliographic entry see Field 05D.
W72-13290

EFFICACY OF UNDERGROUND FILTRATION INSTALLATIONS WITH RESPECT TO SALMONELLA,
Meditsinskii Institut, Kiev (USSR).
B. M. Duchinskii.
Gig Sanit. Vol 35, No 10, p 93-94. 1970.
Identifiers: *Water treatment, *Water pollution treatment, Filtration, Installations, *Salmonella, Springs.

Spring water containing Salmonella at concentrations up to 10 to the 9th power/l may be effectively decontaminated by filtration through 1 m of medium-grade sand at a filtration rate not exceeding 15

l/day per running meter of irrigation network. After biological aging of the filter system the filtration rate may be safely increased to 30 l/day per running meter.--Copyright 1972, Biological Abstracts, Inc.
W72-13423

APPLICATION OF SILVER TO DRINKING WATER IN SMALL AGRICULTURAL COMMUNITIES (IN GERMAN),
Water Hygiene Inst., Gelsenkirchen (West Germany).
H. Althaus.
Arch Hyg Bakteriol. Vol 154, No 6, p 574-576. 1971. Illus. English summary.
Identifiers: *Water treatment, Chlorination, Potable water, Disinfection, *Silver, Tolidine.

Under certain circumstances the electrical application of silver to drinking water may act as a means of degermination. The number of failures is so high with this method that it cannot be recommended for reasons of hygiene. Chlorination involving lower costs, more likely success, and being simple to check with o-tolidine should be given preference.--Copyright 1972, Biological Abstracts, Inc.
W72-13435

TURBULENCE IN ORTHOKINETIC FLOCCULATION,
California Univ., Berkeley. Sanitary Engineering Research Lab.
For primary bibliographic entry see Field 05D.
W72-13506

INTERACTION OF A FLOCCULANT SOL AND GRANULAR FILTER MEDIA,
Rensselaer Polytechnic Inst., Blacksburg, Va.
J. J. Cochrane.
Available from University Microfilms, Ann Arbor, Mich, Order No. 67-4161, Microfilm $3.00, Xerox $9.25. Ph. D. Dissertation, 1966. 202 p.

Descriptors: *Filtration, *Deposition, *Flow rates, *Mathematical models, *Water treatment, Flocculant, Hydraulic gradient, Waste water treatment.
Identifiers: *Alum, *Sand filters, Floc concentration, Deposit profiles, Differential equations.

The interaction of a flocculant sol and granular filter media was investigated by examination of the physical characteristics of deposits within a filter. The floc was produced from the common coagulant, aluminum sulfate. Removal from solution was by a uniformily graded, almost perfect spherical type of silica sand. Operating variables such as alum floc concentration, flow rate and anions were employed to study the interactions. A method was developed which relates the change in hydraulic gradient due to deposition to the volume of deposited material. Deposit profiles through the filters indicated that there were 3 different classifications possible when filtering a flocculant sol. It was concluded that filters should be operated under the conditions required for controlled penetration in conjunction with a continuous recording turbidimeter to insure a high quality effluent. Results indicated that the initial deposition of the floc was in a highly hydrous state and subsequent removal was by a floc to floc interaction with an accompanying dehydration. (Galwardi-Texas)
W72-13513

APPARATUS FOR IRRADIATING A LIQUID,
Controlex Corp. of America, Croton Falls, N.Y.
For primary bibliographic entry see Field 05D.
W72-13523

TREATMENT OF WATER,
H. B. H. Cooper.
U. S. Patent No. 3,547,810, 3 p, 1 fig, 2 ref; Official Gazette of the United States Patent Office, Vol. 881, No. 3, p 1125, December 15, 1970.

Descriptors: *Patents, *Water treatment, Demineralization, Resins, Ion exchange, *Chlorination, Electrolysis, Sodium chloride.
Identifiers: Sterilization.

The water treatment system is based on a sodium chloride electrolytic cell which is operated to provide an aqueous caustic soda stream (free of salt), chlorine gas, and hydrogen gas. Both gases are combined in the hydrogen chloride generating cell and absorbed in water. The aqueous caustic soda regenerant stream and the hydrochloric acid regenerant stream are available for regeneration of the anionic and cationic exchange resins. A portion of the chlorine produced in the electrolysis cell is used for sterilizing the water being processed. (Sinha-OEIS)
W72-13539

CONTROL OF TASTE AND ODOR IN MISSOURI RIVER WATER,
Omaha Metropolitan Utilities District, Neb.
J. F. Erdei.
Journal of the American Water Works Association, Vol 55, No 12, p 1506-1522, December 1963. 7 fig, 9 tab, 12 ref.

Descriptors: *Water treatment, Water quality, *Actimycetes, *Taste, *Odor, *Organic matter, *Activated carbon, *Chlorine, Gas chromatography, Spectroscopy, *Missouri River, Pollutant identification, Nebraska.
Identifiers: Permanganate.

Problems on the Missouri River are discussed. Activated carbon filters and CCE studies, odor potentials of organic pollutants and actimoycetes are described. Studies of actinomycetes should be continued and expanded along the main stem of the river; silt particles bearing organic pollutants can produce odors in finished water if they are not completely removed the carbon filter (CCE) is a good tool for study of organic chemicals in the river; the significant odor-producing materials are concentrated in the neutral and weak-acid groups, as defined by the USPHS.; further evaluation of the use of chlorine and potassium permanganate in removing the tastes and odors from Missouri River water must be undertaken. Studies are being made of organic materials of taste and odor significance extracted from raw and finished waters from the Missouri River. Also, use of gas chromatography techniques and infrared spectroscopy are being investigated for determining chemical characteristics of natural decomposition products which can or may cause taste and odor problems. (Bean-AWWARF)
W72-13598

INTERNATIONAL SIGNIFICANCE OF WATER PURIFICATION,
Stanford Univ., Calif. Dept. of Civil Engineering.
R. Eliassen.
Journal American Water Works Association, Vol 55, No 7, p 831-844, July 1963. 7 fig, 9 ref.

Descriptors: *Water purification, *Public health, *Diseases, *Economics, *Training, Potable water.

Typhoid fever has virtually disappeared from those countries blessed with adequate water purification facilities. In the USA the rate is 1 per 100,000 population; in So. America it averages 50 per 100,000. In two countries the death of children under 5 exceed 1,000 per 100,000 population. Disinfected water can prevent most of these deaths. Prevention of waterborne disease has only succeeded in the developed countries through excellence in management, design, construction, and operation of water supply systems. The international significance of water treatment can well be considered in terms of economics-the improvement in health to make individuals more productive and thus serve to enhance the economy of their country. WHO has responded to requests by sending teams of consultants in the field of engineering, finance and public administration to study problems in developing countries and submit recommendations for action. The developing countries would like to receive grants for the complete design and construction of water supply systems. This is impossible as hundreds of billions of dollars would be required. Assistance is given by AID of the U.S. Dept. of State, the World Bank, the International Development Assoc., The inter-American Development Bank, and Export-Import Bank and Development Loan Fund of the U.S. One of the principal objectives of the Community Water Supply Development Program of AID is the training of water utility personnel. (Bean-AWWARF)
W72-13599

THE NEXT FIFTY YEARS IN WATER PURIFICATION,
Hazen and Sawyer, New York.
R. Hazen.
Journal American Water Works Association, Vol 55, No 7, p 825-830, July 1963. 1 tab.

Descriptors: *Water purification, Sanitary engineering, *Public health, *Standards, *Electrolytes, Filtration, Disinfection, Clarification, Desalinization, Taste, Odor, Water softening, *Water quality standards.
Identifiers: *Coagulant aids.

The next 50 years will reflect concern for maintaining existing standards in the face of declining raw-water quality. Discoveries demonstrating the need for removal of natural substances long considered harmless and discoveries demonstrating the desirability of adding things to water should not be ruled out. Predictions include reduction of coagulant quantities by use of aids, the 'burning' of color by chlorine or other oxidizing agents, a continuance of the importance of filtration since good sterilization is dependent on good clarification, much greater reuse of water in some parts of the country, and an increase in desalinization. People have demonstrated a willingness to pay for soft water and taste and odor free water. (Bean-AWWARF)
W72-13600

ADVANCES IN WATER TREATMENT,
Omaha Metropolitan Utilities District, Nebr.
J. F. Erdei.
Journal American Water Works Association, Vol 55, No 7, p 845-856, July 1963. 1 tab, 16 ref.

Descriptors: *Water treatment, Sanitary engineering, *Pathogenic bacteria, Algae, Organic matter, Radioactivity, Pesticides, Taste, Odor, Coagulation, Electrolytes, Potable water.

Reviews were conducted of the status of increasing water pollution problems. Use of chemicals, new scientific tools, analytical techniques, treatment processes, polyelectrolyte usage, coagulation, jar test, pathogenic organisms, algae, trace elements, pesticides, radiosotopes, and tastes and odors, are discussed. More study is needed on methods of treating drinking water, a good share of which should involve organic contaminants. There is no assurance that such harmful substances in solution will signify their presence by producing taste or odor, and many interesting opportunities for research exist in these areas. (Bean-AWWARF)
W72-13601

EFFECT OF FILTRATION RATE CHANGES ON QUALITY,
Iowa State Univ., Ames. Dept. of Civil Engineering.
J. L. Cleasby, M. M. Williamson, and E. Baumann.

Journal American Water Works Association, Vol 55, No 7, p 869-880, July 1963. 4 fig, 3 tab.

Descriptors: *Water treatment, Water quality, *Filtration, *Turbidity, Iron compounds, Copper, Flow rates, Head loss, *Filters, *Suspension, Effluents.

An investigation was conducted with three types of influent suspensions and two filtering facilities. The filters were operated in a normal manner and at constant rate to head loss of 3.5-5.0 ft. The rate was then increased to a predetermined amount at a predetermined rate of increase, and the effluent was monitored for turbidity and iron content. Hydrous ferric oxide floc suspension was filtered in 12 runs and a similar floc, prepared with 0.5 ppm of copper ($CuSO_4$ solution) added, in 24 runs. The influent iron concentration was in all runs 10 ppm. The iron floc without the copper catalyst was the stronger. It was found that iron concentration in the effluent builds up rapidly after the disturbance of rate change, reaching a peak, then decreasing to very nearly the previous concentration within one hour, after some of the dislodged material has redeposited in lower layers of the filter and equilibrium has been reestablished between the shear forces and depositing forces. The amount flushed through the filter was dependent on the magnitude of the rate disturbance, on the rapidity with which the rate is disturbed, and on the type of material being filtered. (Bean-AWWARF)
W72-13602

CHEMICAL CHARACTERISTICS OF FULVIC ACID,
Florida Univ., Gainesville. Dept. of Chemistry.
A. P. Black, and R. F. Christman.
Journal of the American Water Works Association, Vol 55, No 7, p 897-912, July 1963. 10 fig, 8 tab, 4 ref.

Descriptors: *Water treatment, *Fulvic acids, *Color, *Organic matter, *Chlorine, Infrared radiation, Analytical techniques, Pollutant identification.
Identifiers: Ozone, Chlorine dioxide.

Experimental evidence of the chemical properties and structural characteristics of the organic materials responsible for the coloration of water is presented. Infrared spectra of the fulvic acid fraction of each colored water were very similar, and confirmed the assumption that these materials are hydroxy carboxylic acids, and gave strong indications of unsaturation and aromacity. The effects of ozone, chlorine dioxide, and chlorine on the color values of the waters studied were evaluated. Effects of oxidants on color removal is generally assumed to be oxidation of the organic matter to carbon dioxide and water. That this is not true is shown by the results. Chlorine oxidation was found to produce ether-soluble oxidation products. The infrared spectra of the substances suggested that they are polyhydroxy carboxylic acids containing disubstituted phenyl rings. (Bean-AWWARF)
W72-13603

USE OF SUBMERGED FILTERS,
Saint Louis County Water Co., University City, Mo.
H. O. Hartung, and J. L. Tuepker.
Journal of the American Water Works Association, Vol 55, No 9, p 1165-1173, Sept. 1963. 3 fig, 3 tab, 2 ref.

Descriptors: *Water treatment, *Filters, *Filtration, *Design, Water softening, *Missouri.
Identifiers: *Submerged filters, Backwashing, *St. Louis.

The submerged filters at the South County Plant of the St. Louis County Water Co. are contained within a basin providing softening, coagulation, sedimentation; the water then passes downward through the filters at the effluent end of the basin. The filters have Wheeler bottoms, 12 in. of gravel and 27 in. of sand. The filters are some 3600 sq. ft. in area, divided in two sections to allow backwashing. The wash water rises above the surrounding walls and carries the wastes into the settling areas of the basin, where they resettle. More wash water is required than with conventional filters, but none is wasted or lost. The added wash water pumping costs are minor compared to the saving of the wash water. Surrounding filter walls rise about 2 ft. above the sand. No surface wash equipment is required. During backwashing all the filters and basins are completely out of service, but this is accomplished at off-peak during the night. Filter beds are skimmed semi-annually as preventive maintenance. Filtering to waste after backwashing has not been found necessary. Compared to conventional filters the annual saving on construction costs is considerable. (Bean-AWWARF)
W72-13604

CHEMICAL ASPECTS OF ACTINOMYCETE METABOLITES AS CONTRIBUTORS OF TASTE AND ODOR,
Iowa Univ., Iowa City. State Hygienic Lab.
R. L. Morris, J. D. Dougherty, and G. W. Ronald.
Journal of the American Water Works Association, Vol 55, No 10, p 1380-1390, October 1963. 7 fig, 1 tab, 8 ref.

Descriptors: *Water treatment, *Actinomycetes, *Algae, *Taste, *Odor, Water quality control, Pollutant identification, Iowa.
Identifiers: *Metabolites, *Cedar River (Iowa).

The extremely severe musty tastes and odors that occurred in the Cedar River were due to certain metabolites of the actinomycetes, particularly a 'neutral fraction'. No correlation existed between the intensity of taste problems and threshold odor values, as the burning, musty taste of critical fractions of actimycete cultures were far more persistent than the associated odor phenomena. Metabolites were extracted, purified and determination made as to which produced the typical tastes and odors. These were purified by elutriation with various solvents. When the remaining ether solution was dried with sodium sulfate a pale yellow oil called the 'neutral fraction' was reclaimed; it had a decidedly musty taste and odor. Various 'neutral fractions' in spectrograms, showed correlations of bound hydroxyl and carbonyl groups at wavelengths 2.9-2.95 and 5.8-5.85 microns respectively. (Bean-AWWARF)
W72-13605

REVIEW OF THE BACTERICIDAL EFFECTIVENESS OF SILVER,
Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio.
R. L. Woodward.
Journal of the American Water Works Association, Vol 55, No 7, p 881-886, July 1963. 1 tab, 7 ref.

Descriptors: *Water treatment, *Public health, *Disinfection, *Silver iodide, Water quality standards, Phosphates, Chlorides, Sulfides, Hardness (Water), Reviews, *Bactericides.

Silver has never been used extensively in water disinfection and the literature is notable for its contradictions. Evidently some significant factor affecting the performance of silver is not being adequately controlled, but the identity of this factor is unknown. One problem is the development of a sensitive and precise analytical method for silver in the parts per billion range. Information on the interfering substances is needed. The fact that silver does not impart taste, odor or color makes it attractive for use. Its slow bactericidal action is in some situations a disadvantage. Its effect on viruses is not known. Until some of the uncertainties are resolved it should be used in drinking water only where substantial factors of safety can be provided and where the bacterial effectiveness can be monitored. The USPHS Drinking Water Standards contain a limit of 50 ppb for silver, based not upon toxicity but upon deposition of silver possibly causing argyria, which is cosmetically objectionable. The bactericidal effects of silver are known to be subject to interference by phosphates, hardness, chlorides, sulfides and other sulfur compounds. (Bean-AWWARF)
W72-13606

REVIEW OF THE RELATION OF WATER QUALITY AND SIMPLE GOITER,
Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio.
R. L. Woodward.
Journal of the American Water Works Association, Vol 55, No 7, p 887-896, July 1963. 1 tab, 26 ref.

Descriptors: *Water treatment, *Public health, *Iodine, Calcium, Fluoride, Hardness (Water), Organic matter, Nitrate, Reviews, Potable water.
Identifiers: *Goiter.

Goitrogenic materials are present in some waters. This is not to deny the major role of iodine deficiency as a cause of goiter, but to emphasize that other factors may contribute. Around the turn of the century the importance of iodine in thyroid metabolism was well established. Calcium and fluorine have been implicated as causing goiter, also hard water, but descriptions of the waters involved suggest other pollutants such as high organic matter and nitrates. Boiling of the water was found to eliminate the goitrogen. On one river, goiter incidence in the farthest upstream village was 11.8% and increased to 45.6% in the village farthest downstream; a nearby village that obtained drinking water from a spring was goiter free. Of 35 volunteers who drank some suspended matter from the downstream water supply, but otherwise used only water from the spring, 10 developed marked goiter enlargements in two weeks and five others developed swellings. Water from certain wells is known to have produced goiter. Hettche found a compound (urochrome) in water which produced goiter in rats. The effect on thyroid functions of organic contaminants of water, other than urochrome has not been investigated. (Bean-AWWARF)
W72-13607

STATUS OF FLUORIDATION IN THE UNITED STATES AND CANADA, 1961.
American Waterworks Association, New York. Task Group 2620P.

Journal of the American Water Works Association, Vol 55, No 5, p 571-580, May 1963. 3 fig, 10 tab, 4 ref.

Descriptors: *Water treatment, *Fluoridation, *Fluorides, United States, Canada, Public health, Texas, Water supply.
Identifiers: Bartlett (Tex).

97 SYSTEMS SERVING 106 COMMUNITIES IN THE U.S. and Canada started fluoridation in 1961 (80 in U.S. and 20 in Can.). Total is now 1,329 systems serving 43,700,000 people, plus 7,300,000 using naturally fluoridated water with more than 0.7 ppm. There are also 84 military installations in the U.S. which fluoridate and serve 776,980 persons. Also 56 military installations receive fluoridated water from civilian systems. Only 6% of communities with population less than 2,500 have so far adopted fluoridation. Maryland leads the States with 91% of the population using fluoridated water. There were no shortages of fluoride compounds in 1961. A dental examination of children living in Bartlett, Texas, was repeated after 8 years of using partially defluoridated water which had previously contained 8.0 ppm fluoride.

Fluorosis had practically disappeared as a result of this water treatment. (Bean-AWWARF)
W72-13608

5G. Water Quality Control

WATER QUALITY STANDARDS SUMMARY FOR INTERSTATE WATERS OF THE DISTRICT OF COLUMBIA.
District of Columbia Dept. of Public Health, Washington. Water Quality Control Div.

Federal Water Pollution Control Administration--District of Columbia Department of Health Cooperative Report, July 1, 1970. 16 p, 1 fig, 2 plate, 2 tab, append.

Descriptors: *Water quality standards, *Water Quality Act, *Interstate rivers, *Water quality control, *District of Columbia, Water pollution control, Sampling, Networks, Water analysis, Chemical analysis, Documentation, Reviews.

In the Water Quality Act of 1965, Congress authorized the establishment of water quality standards for interstate (including coastal) waters. The standards for interstate waters which the District of Columbia adopted on June 29, 1967 were submitted to the Department of the Interior. The standards became fully approved as both the District of Columbia and Federal standards, enforceable under the District's water pollution control statutes and the Federal Water Pollution Control Act, as amended (Section 10). The standards consist of three major components: (1) designation of the uses which interstate waters are to serve, (2) specification of narrative and numerical criteria to protect and enhance water quality, and (3) specification of a plan of implementation and enforcement, including treatment and control requirements for municipal, industrial, and other wastes discharged to or affecting interstate waters. The District collects samples from approximately 50 locations in the general area of the District of Columbia. Although the sampling frequency may vary from station to station, each individual station has been scheduled a frequency which conforms to the overall program. (Woodard-USGS)
W72-13049

EFFECTS OF NONIONIC SURFACTANTS ON MONOCOTS,
California Univ., Riverside. Dept. of Plant Pathology; and California Univ., Riverside. Dept. of Soils and Plant Nutrition.
For primary bibliographic entry see Field 05C.
W72-13050

CONSUMER WILLINGNESS TO PAY FOR POLLUTION ABATEMENT,
Guelph Univ. (Ontario).
D. A. L. Auld.
August, 1971. 19 p, 4 tab.

Descriptors: *Pollution abatement, *Cost allocation, Taxes, Regression analysis, Income, Education, Age, *Canada.
Identifiers: *Consumers, *Charges, *Hamilton (Canada).

To obtain information about consumers' willingness to pay for pollution abatement a short questionnaire was mailed to approximately 1900 residential households in the city of Hamilton, Canada early in 1971. There were 395 respondents. The data were used to estimate the parameters of two regression models. The first model posits the willingness to pay for 'primary' environmental improvement as a linear function of income, education, and age. These variables accounted for only about 10 percent of the variance in the willingness to pay for 'primary' improvement. The second model employed the same explanatory variables as the first, but replaced the willingness to pay for 'primary' improvement with the willingness to pay for 'secondary' environmental improvement. This model explained only about 14 percent of the variation in the dependent variable. Thus, it is clear that additional factors, other than level of income, age, and education, must substantially explain consumer willingness to pay for pollution abatement. While many of these additional factors may be difficult to quantify in a statistical sense, it seems that further useful information might be obtained through in-depth, personal interviews. (Settle-Wisconsin)
W72-13085

TOWARD AN ECONOMICS OF ECOLOGY,
For primary bibliographic entry see Field 06G.
W72-13087

EXTERNALITIES AND THE RACE FOR ECONOMIC GROWTH IN THE USSR: WILL THE ENVIRONMENT EVER WIN,
Wellesley Coll., Mass.
M. I. Goldman.
Journal of Political Economy, Vol 80, No 2, p 314-327, 1972. 12 ref.

Descriptors: *Pollution abatement, *Cost-benefit analysis, *Real costs, Economic efficiency, Prices, Environmental effects.
Identifiers: *Socialism, *Incentives, *Externalities, Social costs, Private costs, USSR.

Theoretically there should be no divergence between private and social costs in a socialist state like the USSR. Furthermore, it would seem to be in the interest of the USSR to make each factory pay for the social costs it generates. If each factory were accountable for both private and social costs there would presumably be considerably less pollution of the air, water, and land. Yet, in practice almost no effort is made in the USSR to assign social costs. Consequently, the Russian factory manager has no economic incentive to clean up his plant's pollution himself. There are several factors contributing to this failure to account for social costs. Marxist ideology makes it difficult to justify a charge on such free goods as air and water. Setting prices is such an immense undertaking that in many instances the State Committee on Prices does a poor job, and thus misallocates resources. Cost-benefit ratios are subject to manipulation by project-oriented planners and engineers. Also, the emphasis placed on high national growth rates assures that few incentives will be provided for pollution control. However, due to the scarcity of consumer goods, the USSR's solid-waste problem is reduced. (Settle-Wisconsin)
W72-13088

ENVIRONMENTAL REPERCUSSIONS AND TRADE THEORY,
Michigan State Univ., East Lansing.
A. Y. C. Koo.
Michigan State University, Econometrics Workshop Paper No 7102, October, 1971. 29 p, 4 fig, 10 ref.

Descriptors: Pollutants, *Pollution abatement, *Economic impact, Theoretical analysis, Comparative productivity, *Mathematical models, *Linear programming, Input-output analysis, *Model studies.
Identifiers: *International trade theory, Comparative advantage.

Pollution, or environmental repercussions, are incorporated into a linear trade model in order to study the impact of pollution on volume, terms, and direction of trade. The model assumes that environmental disruptions create a problem only to the extent that additional resources will be consumed to remove them. The model suggests that the impact of pollution on the pattern, volume, and terms of trade depends largely on preferences toward the environment and the technology of pollution abatement. This result implies that such natural resources as clear water, open space, and fresh air can be included in the determination of a country's comparative advantage. These natural resources can be traded off for material well-being if a country so chooses. Consequently, two countries could find trade profitable despite identical transformation surfaces if their environmental preferences differ. An interesting hypothesis suggested by the model is that nations will tend to specialize in and export goods whose production will generate pollutants with which they are better equipped or more able to handle and to import those goods which would generate pollution which they are less able or ill-equipped to handle. (Settle-Wisconsin)
W72-13093

SOCIO-ECONOMIC ACCOUNTING AND EXTERNAL DISECONOMIES,
Texas Univ., Arlington. Dept. of Accounting.
R. W. Estes.
The Accounting Review, Vol 47, No 2, p 284-290, April, 1972. 19 ref, append.

Descriptors: *Pollution abatement, *Pollution taxes (Charges), *Real costs, Pollutants, Research priorities.
Identifiers: *Socio-economic accounting, *Accounting, *Social costs, Externalities, External diseconomies.

External diseconomies can be defined as the damages, or negative effects, inflicted on outsiders by activities of an entity which are not recognized explicitly as costs by that entity, and for which the outsiders are not adequately compensated. The most obvious forms of external diseconomies are the various forms of pollution such as air and water pollution. While several solutions to the pollution problem are possible, recent developments suggest that the most feasible solution will involve forcing firms to internalize their external diseconomies by taxing them according to some monetary measure of social costs. The assessment of these charges will involve accountants at several levels, from the estimation of social costs through the ultimate inclusion of such costs in financial reports. Unfortunately, accountants have tended to avoid monetizing external diseconomies. Yet there are many questions that must eventually be investigated, and they should be investigated now rather than after pollution charges have become widespread. Foremost among the needed study projects would appear to be one aimed at developing and field-testing techniques for measuring social costs. Other projects might involve studying such problems as the potential effects on firms of assessments for social costs. (Settle-Wisconsin)
W72-13094

A CO-OPERATIVE RESEARCH PROGRAM ON KRAFT PULP MILL EFFLUENT QUALITY,
British Columbia Research Council Vancouver.
For primary bibliographic entry see Field 05C.
W72-13106

WATER POLLUTION AND THE KRAFT PULP MILL INDUSTRY,
British Columbia Research Council Vancouver. Div. of Applied Biology.
For primary bibliographic entry see Field 05C.
W72-13109

NEW DEVELOPMENTS IN AERATION SYSTEMS FOR LARGE RIVERS,
Rutgers - The State Univ., New Brunswick, N.J.; and Princeton Univ., N.J.
W. Whipple, Jr., L. Yu Shaw, and G. E. Mattingly.
Water Resources Bulletin, Vol 8, No 1, p 3-14, Feb. 1972. 7 fig, 22 ref.

Descriptors: *Water quality control, *Aeration, *Dissolved oxygen, *Oxygenation, *Pollution control, Navigable rivers, Costs, Biochemical oxygen demand, Dispersion, Diffusion, Stream pollution, Bibliographies, Equipment, Rivers, Estuaries.
Identifiers: *Delaware River.

The practicability and economy of artificial aeration of small rivers has been established, but the more important problem areas are concerned with large navigable polluted rivers, such as the Potomac, the Delaware, and the Houston Ship Canal. The use of supplemental or induced oxygen on large tidal rivers has been approached theoretically. The problems involved in applying such techniques to the Delaware Estuary are discussed. The basic oxygen regimen problems of large navigable estuaries, although similar in principle to those of small rivers, require a different approach. Wind and wave action modify air-water interface transfers, and require sturdy construction and mooring of surface equipment. Navigation requirements also pose definite constraints on design. The mere size of the river makes measurement of oxygenation effects of aerators difficult. The most challenging set of problems concerns the dispersion of oxygenated water throughout the great mass moved by the tidal cycle, and the effects of dispersion characteristics of individual aerators upon system design. These aspects must be incorporated into systems approaches to determine an optimum water quality control plan. (USBR)
W72-13132

MATHEMATICAL MODEL FOR RATE STUDIES,
Camp, Dresser and McKee, Boston, Mass.
K. M. Yao.
Journal of the Sanitary Engineering Division, American Society of Civil Engineers, Vol 98, No SA4, Paper 9146, p 635-645, August, 1972. 5 fig, 5 ref, 2 append.

Descriptors: *Water supply, *Sewage disposal, *Project planning, *Estimating, *Cost analysis, Mathematical models, Computer programs, Digital computers, Operating costs, Inflation (Economic), Sanitary engineering, Long-term planning, Alternative planning, Operation and maintenance.
Identifiers: Revenues, Financial planning.

A mathematical model is developed for estimating the total annual cost of a public water supply or waste water disposal system to provide cost information for rate studies. The model is also a good tool for comparing alternative projects in water resources planning. The estimated annual costs are in the form of a time series useful for long-range planning. The model is adaptable to digital computer programming, an ideal tool for thorough investigation of a water system where the nature of the total annual costs are time-dependent or dynamic. The model reflects the effects of parameter changes such as the interest rate, the rate of inflation, and construction cost increases, on the estimated annual costs. A numerical example illustrates the application of the model. Results of the example indicate that inflation has significant influence on the financial requirements of the system for its proper operation. Ignoring inflation in cost estimates may result in inadequate revenue and the need of frequent adjustments of the rate schedule. A sample computer program is presented to show the programming technique required to obtain correct results. (Bell-Cornell)
W72-13135

DIMENSIONS OF THE ENVIRONMENTAL CRISIS,
For primary bibliographic entry see Field 06G.
W72-13145

ROCK SALT AS AN URBAN TRACER,
Columbia Univ., Palisades, N.Y. Lamont-Doherty Geological Observatory.
For primary bibliographic entry see Field 05B.
W72-13164

SHORELINE STUDY-PHASE III, WATER USE DEVELOPMENT PLAN.
Titusville Planning Dept., Fla.

June 1971. 62 p, 7 fig, 4 tab. HUD, Florida P-121E.

Descriptors: *River regulation, *Shores, *Urbanization, *Water quality control, *River basin development, Land management, Water resources development, Comprehensive planning, Rivers, Florida.
Identifiers: *Indian River, *Titusville (Florida), *Shoreline development, Intracoastal Waterway.

Existing conditions and potentials were studied for utilization of the Indian River at Titusville. Policy recommendations were studied that can be used by the City of Titusville to avoid some of the problems of intensive urbanization now being faced by so many Florida communities. Because of the focus on future water use policies and plants, an additional emphasis has been placed on unique problems directly and indirectly related to the water area that result from interaction among man-made and natural factors. Previous studies, Phase I and Phase II, identified existing conditions and problems, presented and evaluated alternative plans for use of the shoreline, and summarized background information. The deposition of solid wastes and derelict vehicles should be prohibited within the River or along the shoreline. Surface drainage of stormwater is recommended to be directed inland to groundwater recharge areas, rather than permitted to flow to the River's edge. Sanitary sewage effluent should be prohibited from discharge into the Indian River, or, at least, deposited far out from the shoreline to enhance dispersion of contaminants throughout the receiving waters. Other recommendations include control of boating activities, dredging, aesthetically objectionable structures, utility lines, and the construction of bulkheads to retain fills along the shoreline. (Poertner)
W72-13167

FACTORS PERTINENT TO WATER QUALITY IN THE ALBUQUERQUE METROPOLITAN AREA,
Albuquerque Urban Observatory, N. Mex.
For primary bibliographic entry see Field 06D.
W72-13168

ENGINEERING CONCEPT EVALUATION PROGRAM FOR HIGH SEAS OIL SPILL RECOVERY,
Lockheed Missiles and Space Co., Sunnyvale, Calif. Ocean Systems Div.
B. Bruch, K. R. Maxwell, and H. G. Ulbrich.
Available from the National Technical Information Service as AD-725 883, $3.00 in paper copy, $0.95 in microfiche. U. S. Coast Guard, Office of Research and Development, Washington, D.C., December 1970. 194 p, 66 fig, 15 tab. DOT-CG-00595-A.

Descriptors: *Oil spills, *Model studies, *Oil pollution, *Water pollution control, Oceans, Ships, Harbors, Coasts, Coast Guard regulations, Transportation, Water pollution, Performance, Measurement, Testing.
Identifiers: *Oil recovery, *Tankers, Shipping.

Model tests and engineering studies were made of a proprietary Lockheed oil spill recovery device. The principal objective of the U. S. Coast Guard was to obtain parametric engineering evaluation information, performance characteristics, and scaling ratios for the oil recovery device. Oil recovery tests were conducted with four different size models in four test facilities, with four different oils and with emulsions of these oils, under forward way with and without waves. A method was established for estimating oil recovery. The primary factors affecting performance were: forward way or current, oil film thickness, support vessel response to waves, and oil viscosity and emulsification. Oil paraffin or asphalt content, oil specific gravity, and surface tension yielded small second-order effects. Sizing of the oil recovery device and extrapolation of oil recovery rates from existing test data can be accomplished using an idealized theory developed for static operation. The static theory was verified by 13 test results with 4 different size devices. It indicates that the oil recovery rate varies with the 5/2 power of the disc radius and with the 3/2 power of the disc rotational speed up to a maximum of 12 rpm. Oil recovery can be maximized by concentrating the slick to 1/3 in. The rate varies linearly with ingested slick thickness to below 0.005 in. Tests established that the device will recover 70 percent of any oil thickness encountered on a single pass. This can be increased by successive passes to 90 and 97 percent. However, if oversupplied, it will bypass the excess. (Poertner)
W72-13172

REGION NINE POLLUTION CONTINGENCY PLAN.

Available from the National Technical Information Service as PB-200 490, $3.00 in paper copy, $0.95 in microfiche. Commander, Twelfth Coast Guard District, San Francisco, California, December 1970. 384 p, 32 fig, 56 tab.

Descriptors: *Oil spills, *Oceans, *Oil pollution, *Water pollution control, *Hazards, *Planning, Ships, Harbors, Coast Guard regulations, Water pollution.
Identifiers: *Shipping, Emergency plan, Hazardous spills.

The Region Nine Contingency Plan, prepared within the framework of the National Multi-agency Oil and Hazardous Materials Pollution Contingency Plan, provides a mechanism for coordinating response to a spill of oil or other hazardous substances. This plan covers all the coastal waters of California, Hawaii, Guam, American Samoa, and the U. S. Trust Territories of the Pacific Islands. It supplements the National Oil and Hazardous Materials Polution Contingency Plan and provides for coordinated response by Federal agencies to polluting spills of oil and hazardous materials to minimize damages. It assigns responsibilities to the concerned Federal agencies; establishes a system of surveillance and notification; prescribes pollution cleanup and control procedures; designates regional response centers and on-scene commanders to coordinate and direct response operations; lists available response equipment and supplies; establishes a regional response team and other trained pollution response forces; and describes restrictions on use of dispersants and other chemicals. It also provides for coordination among Federal, state, local, and non-governmental response systems. Agencies and organizations participating in this plan include the following: departments of Defense, Interior, Transportation, and Health, Education and Welfare; Office of Emergency Preparedness; state governments of California and Hawaii; territories of Guam, American Samoa, and Trust Territories of the Pacific Islands; local governments and agencies; affiliate organizations of the American Petroleum Institute; and the Marine Oil and Hazardous Materials Spill Cleanup Contractors. (Poertner)
W72-13173

POTENTIAL FOR CONTROLLING QUALITY OF IRRIGATION RETURN FLOWS,
Robert S. Kerr Water Research Center, Ada, Okla.
J. P. Law, Jr., and G. V. Skogerboe.
Journal of Environmental Quality, Vol 1, No 2, p 140-145, April-June, 1972. 1 fig, 23 ref.

Descriptors: *Water quality control, *Irrigation efficiency, *Pollution abatement, Water conservation, Salinity, Nutrients, Pesticides, Soil erosion, *Return flow, Sediment transport.

Water quality problems associated with irrigation return flows are difficult to assess accurately and to control effectively. They include salinity increase, nutrient loss, sediment transport, and pesticide residue. The effects of these on the quality of receiving waters are discussed. Potential control measures that may prove effective in alleviating the detrimental effects of irrigation return flows are suggested. These may involve physical changes in the system, improvements in present management and cultural practices, or changes in the institutional influences upon the system. The potentials for improving the quality of return flows through changes in the water delivery system, farm water management practices, and water removal system are outlined and discussed. Research investigations will be required to further evaluate the effectiveness of many of the controls suggested. (EPA abstract)
W72-13179

WATER AND AIR QUALITY REPORTING ACT.
For primary bibliographic entry see Field 06E.
W72-13204

DEPARTMENT OF WATER AND AIR RESOURCES. ORGANIZATION AND POWERS; CONTROL OF POLLUTION. RIGHT OF WITHDRAWAL OF IMPOUNDED WATERS,
For primary bibliographic entry see Field 06E.
W72-13207

OFFSHORE DRILLING--THE COMING BATTLE,
House, Washington, D.C.
For primary bibliographic entry see Field 06E.
W72-13209

LET STATES KEEP NO-DISCHARGE REGULATIONS FOR BOATS,
House, Washington, D.C.
For primary bibliographic entry see Field 06E.
W72-13210

BOATING--WATER SANITATION.
For primary bibliographic entry see Field 06E.
W72-13212

POTOMAC RIVER-WASHINGTON METROPOLITAN REGION ENFORCEMENT CONFERENCE.

Potomac Basin Reporter, Vol. 28, Jul 1972. 4 p, 1 map, 1 tab.

Descriptors: *Potomac River, *Basins, *Projects, *Water quality control, Economics, Flow measurement, Federal government, State governments, Sediment control, Water management (Applied), Regional development, Interstate rivers, Information exchange projects, Project post-evaluation.

The Potomac Basin Reporter is published to interest citizens in the cause of a cleaner and more useful Potomac River and to provide for a public informed on problems and plans for development in the Basin. This special issue examines each of the topics the Environmental Protection Agency agendized for the June 20-21, 1972 meeting. It provides interpretation and background information on each item along with official conference recommendations. These topics include funding of the Blue Plains project, the Blue Plains Interim Treatment Program, the Piscataway problem, the Montgomery County facility, building bans, measurement of flows to the Blue Plains, allocation of waste loads, expansion of the conference area, Virginia waste water facilities, federal installations, the Metropolitan regional plan, and sediment control. (Widman-Florida)
W72-13213

RAT CONTROL IN THE SEWER NETWORK OF THE CITY OF MAGDEBURG,
Medizinische Akademie Magdeburg (East Germany).
W. Schuster, and R. Roeder.
Z Gesamte Hyg Grenzgeb. Vol 17, No 8, p 592-594. 1971. Illus.
Identifiers: *Pest control, City, Germany, Magdeburg (East Germany), *Rats, Sewerage, *Public health.

An experimental rat control method that permitted the formulation of recommendations for effective rat control is described. It is applicable to cities and villages with interconnecting sewer pipes, laid at an angle to collect water and having end shafts accessible through a sewer cover from the streets. The bait was specially manufactured in blocks with a hole through which the baits could be attached to an accessible place on the sewer stairs. Evidence of chewing on the bait was looked for. The bait blocks were protected from mold by incorporation of a fungicide. This made the blocks attractive to rats for longer periods. The main point was that the baits should be placed in high locations, where rats would tend to congregate to escape sudden rises in water levels during rainfalls, which would otherwise drown them.--Copyright 1972, Biological Abstracts, Inc.
W72-13216

UNITED STATES V. CROW, POPE AND LAND ENTERPRISES, INC. (DEFINITION OF NAVIGABILITY UNDER THE REFUSE ACT).
For primary bibliographic entry see Field 06E.
W72-13218

ENVIRONMENTAL PROTECTION AGENCY--GENERAL GRANT REGULATIONS AND PROCEDURES; STATE AND LOCAL ASSISTANCE.
For primary bibliographic entry see Field 06E.
W72-13219

MARINE SANITATION DEVICE STANDARD.
For primary bibliographic entry see Field 06E.
W72-13220

AN ACT...IN RELATION TO PROHIBITING INSURANCE COVERAGE AGAINST ENVIRONMENTAL POLLUTION.
For primary bibliographic entry see Field 06E.
W72-13221

AN ACT...IN RELATION TO REMOVAL OF ILLEGAL FILL IN PROTECTED WATERS.
For primary bibliographic entry see Field 06E.
W72-13222

PROPOSED BIG CYPRESS NATIONAL FRESH WATER RESERVE, FLORIDA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
National Park Service, Richmond, Va. Southeast Region.
For primary bibliographic entry see Field 06G.
W72-13224

ON BUYING CLEAN WATER--REFLECTIONS ON THE GEORGIA WATER POLLUTION CONTROLS,
K. L. Hirsch.
Mercer Law Review, Vol 23, No 2, p 603-631, 1972. 73 ref.

Descriptors: *Georgia, *Water quality control, *Pollutants, *Regulation, *Abatement, Standards, Administrative agencies, Adoption of practices, Legal aspects, Political aspects, Decision making, Water management (Applied), Water pollution control, Alternate planning, Water pollution sources, State governments.

The approach to water pollution control established by the Georgia Water Quality Control Act and the regulations promulgated by the Georgia Water Control Board are examined in the light of other available approaches. The factors which determine water quality, the interaction among the various types of pollutants, and the complexity of assessing and regulating point discharges in a waterway with many discharges are considered. The calculation of the impact of projected changes in effluent discharges on water quality can only be accomplished by sophisticated computer techniques. The various legal, political, and technical factors involved, and Georgia's water classification system are discussed. Of the many abatement measures available, Georgia adopted a uniform secondary treatment requirement, which was not the most efficient or equitable choice possible. (Widman-Florida)
W72-13226

GEORGIA'S ENVIRONMENTAL LAW: A SURVEY,
E. B. Benson, Jr.
Mercer Law Review, Vol 23, No 2, p 633-662, 1972. 169 ref.

Descriptors: *Georgia, *Legislation, *Environmental control, *Legal aspects, Air pollution, Water quality control, Marsh management, Mining, Waste disposal, Administrative agencies, Permits, Standards, Regulation, Interstate compacts, State governments, Groundwater, Solid wastes, Water resources development.

The Georgia General Assembly has established four general areas within which state agencies can operate to protect the environment: air quality, water quality, surface mining, and marshlands. The 1964 Air Quality Control Act was amended and broadened in 1971 and now contains specific civil sanctions, reasonable means of imposing these sanctions, and vehicular emission control. The Water Quality Control Act, enforced by the Water Quality Control Board, prohibits the utilization of any state waters for the disposal of any type waste. The Coastal Marshlands Protection Act of 1970 created the Coastal Marshlands Protection Agency and requires a permit for alteration of these lowlands. The surface Mining Act of 1968 provides for regulation of surface mining operations and facilitates reclamation of lands affected by such mining. The Interstate Environmental Compact and legislation considered during the 1972 General Assembly are discussed, including a governmental reorganization bill, the Ground Water Use Act of 1972, the Solid Waste Management Act, legislation for the protection of the Chattahoochee River, and various proposed amendments to existing legislation. (Widman-Florida)
W72-13227

WATER POLLUTION CONTROL LEGISLATION--1971 (H.R. 11896, H.R. 11895).
Hearings on H.R. 11896, H.R. 11895--Comm. on Public Works, House of Representatives, Ninety-second Congress, First Session, December 7, 8, 9, and 10, 1971. 972 p.

Descriptors: *Federal Water Pollution Control Act, *Legislation, *Water quality control, *Water pollution control, Water law, Water pollution, Legal aspects, Watercourses (Legal aspects), Navigable waters, Pollution abatement, Waste disposal, Industrial wastes, Municipal wastes, Administrative agencies, Federal government, State governments, Governmental interrelations, Regulation, Administration, Government finance, Costs, Cost sharing, Permits, Sewage disposal, Effluents, Rivers and Harbors Act.
Identifiers: Refuse Act.

Proposed amendments to the Federal Water Pollution Control Act would require no discharges of pollutants into navigable waters or best available technology by 1981, with a goal of no discharges by 1985. The zero discharge provision is the most contentious issue involved in the amendments. Witnesses for the administration contend that this would be too costly, that such a requirement demands too much of the Nation's productivity and capacities. Another criticism of the bill is that it fails to strike the proper balance between federal and state responsibilities. It is averred by some that the bill will provide a program so dominated by the federal government that the state role will be reduced to performing meaningless ministerial acts. A panel of environmentalists testified in favor of the bill on those two aspects. Other issues discussed include: the permit program, which would in effect continue the program initiated under the Refuse Act; the sufficiency of federal financial assistance to implement the goals of the bill; provisions for citizens suits; and water quality standards and their enforcement. Testimony is included from public officials, environmentalists and representatives of industry. (Brackins-Florida)
W72-13228

A CITIZEN'S ACTION HANDBOOK: THE REFUSE ACT PERMIT PROGRAM,
Natural Resources Defense Council, New York.
J. Tauber, R. Stover, and R. M. Hall.
Natural Resources Defense Council Project On Clean Water, January 1972. 190 p, 2 maps, 7 append.

Descriptors: *Rivers and Harbors Act, *Water pollution control, *Permits, *Administrative agencies, *Federal government, Water law, Legal aspects, Water pollution, Pollution abatement, Water quality control, Regulation, Administration, Waste disposal, Industrial wastes, Water quality standards, Federal Water Pollution Control Act, municipal wastes, Law enforcement, State governments, Navigable waters, Legislation, Control.
Identifiers: *Refuse Act.

The past record of the federal government in water pollution control indicates that the Refuse Act permit program will fall short of its potential unless citizen groups make sure government officials administer the program in the public interest. Hopefully new water pollution controls will be enacted shortly to replace the Refuse Act. There are opportunities for public comment and public hearings of both state and federal levels of the permit application process. This handbook details opportunities for citizen input during all stages of the application process. Initial federal process of permit applications is handled by the permit sections of the Corps of Engineers' district offices and the Environmental Protection Agency's regional offices. The Corps' role is largely administrative, while the EPA's role is to evaluate applications in regard to water quality impact. The state reviews the application to determine whether the discharge will violate its water quality standards. The Corps has full responsibility for the processing and final issuance of all permits; but it is required to recognize the EPA's expertise in water quality matters and to follow the EPA's recommendation to deny a permit. (Brackins-Florida)
W72-13229

OIL/WATER SEPARATION SYSTEM WITH SEA SKIMMER.
AiResearch Mfg. Co., Los Angeles, Calif.

Copy available from GPO Sup Doc EP2.10:15080DJP-10/70, $1.50; microfiche from NTIS as PB-211 604, $0.95. Environmental Protection Agency, Water Pollution Control Research Series, October 1970. 187 p, 93 fig, 16 tab, 4 ref. EPA Program 15080 DJP 10/70.

Descriptors: *Centrifugation, *Oil wastes, *Oily water, *Secondary recovery (Oil), Oil water interfaces, Water pollution treatment, Pollution abatement, Performance, Skimming, Weirs, *Separation techniques.
Identifiers: *Sea skimmer, *Oil-water separation, Oil slicks, Oil spills.

An oil skimming and separation system capable of processing 30,000 gallons per hour, and operating on the open ocean under Sea State 3 conditions, was designed, constructed, and tested by the AiResearch Manufacturing Company. A 45 x 26-foot twin-hulled barge, which contained an entrance paddle wheel and self-adjusting skimming weirs, was built to support the skimming and separation equipment. A 500-gpm centrifuge developed during the program was used to reduce the oil content of the discharge water to less than 100 ppm. The recovered oil contained less than 5 percent water. The oil content of the discharge water could be reduced to less than 20 ppm by recycling it through the centrifuge a second time. The equipment was tested in natural and simulated oil slicks off the coast of Southern California under environmental conditons up to and including Sea State 3. Intentionally spilled oils of API 15, 26, and 35 gravities were recovered and separated, as were weathered oil slicks that resulted from natural under water seeps in the test area. The centrifuge was particularly useful in separating the mixtures of water and the higher API gravity oils. (Galwardi-Texas)
W72-13253

DESIGN OF PVC WATER-DISTRIBUTION PIPE,
Johns-Manville Research and Engineering Center, Manville, N.J. Fluids Handling Dept.
For primary bibliographic entry see Field 08A.
W72-13255

ON MARYLAND'S ENVIRONMENTAL SERVICE,
For primary bibliographic entry see Field 06E.
W72-13256

DRINKING WATER STANDARDS, 1961, US PUBLIC HEALTH SERVICE.
Public Health Service, Washington, D.C.

Journal of the American Water Works Association, Vol 53, No 8, p 935-945, August 1961. 1 fig, 4 tab.

Descriptors: *Standards, Water properties, *Water quality control, *Potable water, Water management, Water analysis, Water supply systems, *Water treatment.
Identifiers: *Drinking water standards.

Guidelines for revising the USPHS 1946 Drinking Water Standards are described. Radioactivity, occurrence of chemical and toxic substances, the bacteriological quality, the physical characteristics, and the methods of analysis of the water supply were considered. Other guidelines were that the standards shall be generally acceptable and be applicable to all public water supplies in the United States. Also, limits shall be grounds for rejection of the supply and shall apply to the water at the free-flowing outlet of the consumer. The revised standards approved by the Secretary of Health, Education and Welfare are included. Approval of water supplies shall be dependent upon enforcement of rules and regulations, adequate protection of water quality, proper operation of the water supply system, adequate capacity to meet peak demands, and records of laboratory examinations. (Britton-AWWARF)
W72-13258

SAVE WATER: AIR CONDENSE STEAM,
Lummus Co., Bloomfield, N. J.
G. M. Black, and W. Schoonman.
Hydrocarbon Processing, p 101-103, October 1970. 3 fig, 2 tab.

Descriptors: *Heated water, *Condensers, *Cooling, Design criteria, Recycling, Industrial water.
Identifiers: Air cooling.

Aircoolers can be used effectively to combat the increasing shortage of cooling water. As competition for the available water increases, aircoolers will then be more widely used for the recovery of steam from power plants and turbine drives as well as for process cooling. The mechanical-draft, direct-condensing system is the most economical and best suited for steam capacities required by HPI plants. Turbine exhaust is distributed to the air-cooler condensing surface, the condensate drains through a manifold to the hotwell tank, then the water is pumped back into the boiler circuit. The vacuum obtained is a function of condenser duty, ambient air conditions and fan power. A figure is included to facilitate determination of performance at other than design conditions. Optimization of the plant steam cycle and operating economics in large part depends on sizing the condenser. Accurate design and performance predictions of air-cooled vacuum steam condensers can be made in a practical sense only by computer since the calculations are complicated and iterative. Freezing protection must be incorporated into the air-cooler design for installations in colder climates. (Eagle-Vanderbilt)
W72-13311

COOLING TOWER SITE CONSIDERATIONS,
Stone and Webster Engineering Corp., Boston, Mass.
D. R. DeHarpporte.
Power Engineering, Vol. 74, No. 8, p 49-51, August 1970. 3 fig.

Descriptors: *Cooling towers, *Sites, *Meteorology, Heated water, *Thermal pollution, Cooling, Winds, Topography, Humidity, On-site data collections.
Identifiers: Inversions.

Power plants cool heated water by exposure to a large amount of air per unit time (cooling towers), a large amount of air per unit volume of heated water by diluting it with a moderate sized body of water (cooling ponds), or an extremely large amount of air per volume of heated water (large lake or ocean site). With most methods heat is transferred through evaporation, resulting in a layer of fog. An especially dense fog is associated with cooling towers. Site selection is based on hydrometeorological criteria. The prevailing wind direction, topography, surrounding roads and cities and frequency of inversion are considered. A description of the method of inversion formation is included. A two phase meteorological site study is recommended. The first is an evaluation of available meteorological data with, possibly, a limited field study to rank the sites considered according to the effects of fogging on the environment. The second is a fully instrumented on-site study lasting at least one year. Wind, temperature and humidity data are measured and continuously recorded on a high tower and predictive estimates of the induced fog are made. (Eagle-Vanderbilt)
W72-13314

COLUMBIA RIVER THERMAL EFFECTS STUDY - VOLUME 2 - TEMPERATURE PREDICTION.
Environmental Protection Agency, Seattle, Wash. Region X.
For primary bibliographic entry see Field 05B.
W72-13316

SHAPE FACTORS FOR COOLING LAKES,
Towne School of Civil and Mechanical Engineering, Philadelphia, Pa.
For primary bibliographic entry see Field 05B.
W72-13318

THE CONTROL OF RIVER HEATING BY ACCURATE DIGITAL SIMULATION,
Motor-Columbus Engineering Co., Baden (Switzerland).
P. Bogh, and H. Zund.
In: Proceedings of the Symposium on Environmental Aspects of Nuclear Power Stations, New York, New York, International Atomic Energy Agency, Vienna, ST1/PVB/261, p 615-624, January 1971. 4 fig, 4 ref.

Descriptors: *Computer models, *Rivers, *Water resources development, *Thermal pollution, Thermodynamics, Nuclear powerplants, Heated water.
Identifiers: *Aare River.

Swiss nuclear power plants depend heavily on river cooling. Thermal discharges from these plants cannot cause the undisturbed river temperature to rise above 3C at any place or time along the river after full discharge and river mixing. A Swiss computer program called THEDY was developed to simulate the thermodynamic behavior of rivers so that optimum siting and minimum cost determinations could be made for nuclear plants within the 3C limit. A description of the THEDY program is given. THEDY was applied to the Aare River and figures show how model predictions compare with actual data for the summer of 1969. Reasons are given for present model inadequacies and the need for further parameter corrections is stated. THEDY is believed to show that good digital simulation of thermodynamic river behavior is possible. (Bass-Vanderbilt)
W72-13322

ENERGY-ENVIRONMENT DILEMMA: SOLUTIONS SOUGHT.

Chemical and Engineering News, Vol 50, No 3, p 15, January 17, 1972. 1 photo.

Descriptors: *Electric powerplants, *Environment, Thermal pollution, Electric power, Locating.
Identifiers: Certification.

A report by the Committee on Power Plant Siting of the National Academy of Engineering is reviewed. It calls for major changes in society's handling of the power plant siting process, including better public understanding of the problems and a new certification system for power plants that takes into account all interests. The report recommends a substantially large, well-planned and coordinated R and D program covering the whole range of knowledge used in setting standards and in making engineering decisions to minimize impact on the environment. Relief of the conflict between the requirement for more electric power and the desire to preserve the environment will be costly and will not completely avoid damage to the environment. (Eagle-Vanderbilt)
W72-13323

UP COOLING TOWER CAPACITY WITHOUT ADDING NEW CELLS,
Phelps Engineering Co., Kentfield, Calif.
For primary bibliographic entry see Field 05D.
W72-13325

CONSERVATIONISTS WIN LAKE COOLING TOWER BATTLE.

Engineering News Record, p 11, March 25, 1971. 1 photo.

Descriptors: *Cooling towers, *Thermal pollution, *Nuclear powerplants, *Conservation, Permits, *Michigan, *Lake Michigan, Costs.

A country-wide thermal pollution standard may be planned as a result of a battle between conservationists and Consumers Power Co., owner of the 700,000 Kw Palisades nuclear powerplant at South Haven, Michigan. The battle started when the power company applied to the Federal Atomic Safety Licensing Board for a license to operate the plant. A group of Michigan conservation organizations, led by the Steelhead Fisherman's Association, intervened in the ASLB hearings and demanded that the plant be equipped with cooling equipment. Although they contend that the heated discharges are not damaging, the company has agreed to build cooling towers. The towers will cost more than $10 million initially plus about $3 million a year in operating expenses. (Eagle-Vanderbilt)
W72-13326

GUIDELINES FOR DISCHARGE WATERS ARE BEING STUDIED.
Electrical World, p 25, January 1, 1972.

Descriptors: *Florida, *Illinois, *Water quality standards, *Thermal pollution, Heated water, Temperature, Freshwater, Oceans, Nuclear powerplants, Utilities.

Two states have set up standards for the discharge of heated cooling water in the hope they will be made into guidelines by federal agencies. The intent of Illinois temperature regulations is to determine the natural 'highs' by month and to permit, in general, 5 F above these highs except when the resulting temperature would adversely affect aquatic life. The 1618 Mw Quad Cities nuclear plant under construction (jointly owned by Commonwealth Edison Co. and Iowa-Illinois Gas and Electric Co.) is greatly affected. Its license to operate even at 20-50% capacity is in jeopardy. The Florida standards would set specific limits on heated discharge depending on what type water it would be discharged into. There is a 90 F maximum limit and no allowance for a mixing zone, these standards are questioned by the state's utilities. (Eagle-Vanderbilt)
W72-13328

WASTE HEAT DISPOSAL IN POWER PLANTS,
Federal Power Commission, Washington, D.C.
For primary bibliographic entry see Field 05D.
W72-13330

MANAGING THE POWER SUPPLY AND THE ENVIRONMENT.
For primary bibliographic entry see Field 06G.
W72-13332

THE EFFECT OF OIL SLICK DISPERSANT, ESSO COREXIT 7664 AND THE JOINT EFFECT WITH CRUDE OIL ON THE SURVIVAL OF MARINE GLASS FISH, AMBASSIS SP. AND PALAEMONID SHRIMPS
Ministry of Agriculture and Lands, Kuala Lumpur (Malaysia). Fisheries Div.
For primary bibliographic entry see Field 05C.
W72-13343

URBAN WASTES MANAGEMENT,
Rutgers - The State Univ., New Brunswick, N. J. Coll. of Agriculture and Environmental Science.
H. E. Besley, and C. H. Reed.
J Environ Qual. Vol 1, No 1, p 78-81. 1972. Illus.
Identifiers: *Municipal wastes, Waste disposal, *Agriculture.

A role for agriculture in the management of urban wastes is presented. The point of view is that of agricultural engineers who would endeavor to gainfully utilize all wastes as a conservation measure, giving particular attention to utilizing biodegradable solid wastes in the soil. Methods or techniques now widely used for the disposal of urban wastes are ocean dumping, land filling, incineration, composting, and reclamation and salvage. However, some restriction or even outright prohibition is being applied to several of these techniques. Therefore, in order to effectively manage urban solid wastes with the ultimate objective of maximum recovery of resources, it is considered essential that land utilization be added to the techniques presently used. Incorporation of wastes directly into the soil, and the equipment necessary to do this successfully are described.--Copyright 1972, Biological Abstracts, Inc.
W72-13396

ANIMAL WASTE MANAGEMENT: PROBLEMS AND GUIDELINES FOR SOLUTIONS,
Cornell Univ., Ithaca, N.Y. Dept. of Civil and Agricultural Engineering.
R. C. Loehr.
J Environ Qual. Vol 1, No 1, p 71-78. 1972.
Identifiers: *Farm wastes, *Waste treatment, Water pollution control, Water pollution sources, Waste disposal.

Changes in animal production have occurred in response to the need for greater production efficiency and to the changes in per capita consumption. These changes include confinement feeding of livestock and increased animals per production unit. The accumulated wastes at these confined feeding operations have become point sources of potential pollution more amenable to both environmental complaints and regulation, and to better waste management and control. Solutions for satisfactory animal waste treatment and disposal will not be direct extensions of approaches that have been successful for industries and municipalities. Although no one treatment or disposal system will be the solution for all operations, there are a number of approaches that can minimize flagrant pollution problems. The most satisfactory solutions for animal wastes include some type of initial treatment followed by disposal on the land. Possible initial treatment methods include aerated liquid systems, natural drying systems, runoff control measures, and waste holding units. For over-all animal waste management, all aspects of the production scheme should be evaluated for interactions and tradeoffs so that an acceptable environment for the public and an adequate profit for the producers can be obtained. Interdisciplinary approaches are required for successful methods of animal waste management. Feasible technical and interdisciplinary approaches that may be desirable are discussed.--Copyright 1972, Biological Abstracts, Inc.
W72-13424

CHEMICAL CONTROL OF CATTAIL, TYPHA LATIFOLIA,
Alberta Univ., Edmonton. Dept. of Plant Science.
For primary bibliographic entry see Field 04A.
W72-13431

FORECASTING THE EFFECTS OF POLLUTING DISCHARGES ON NATURAL WATERS - II, ESTUARIES AND COASTAL WATERS,
Water Pollution Research Lab., Stevenage (England).
For primary bibliographic entry see Field 05B.
W72-13437

THE ROLE PLAYED BY THE FISHERIES RESEARCH BOARD OF CANADA IN THE 'RED' HERRING PHOSPHORUS POLLUTION CRISIS IN PLACENTIA BAY, NEWFOUNDLAND,
Fisheries Research Board of Canada, Halifax (Nova Scotia).
For primary bibliographic entry see Field 05C.
W72-13439

EFFECT OF PESTICIDE CHEMICALS ON MARINE ORGANISMS,
Stanford Univ., Pacific Grove. Hopkins Marine Station.
For primary bibliographic entry see Field 05C.
W72-13441

HAWAII'S SUGAR INDUSTRY FACES TOUGH PROBLEMS.
For primary bibliographic entry see Field 05B.
W72-13451

THERMAL POLLUTION IN UNCHARTED WATERS.
For primary bibliographic entry see Field 05C.
W72-13452

OIL POLLUTION - CAUSES AND CURES,
International Tanker Owners Pollution Federation Ltd., London (England).
For primary bibliographic entry see Field 05B.
W72-13484

METERING SYSTEM TAKES THE WASTE OUT OF SEWAGE COSTS,
Westinghouse Electric Corp., Pittsburgh, Pa.
E. C. Tanner.
Plant Engincering, Vol 25, p 100-101, June 10, 1971. 1 fig.

Descriptors: *Sewage effluents, *Costs, *Flow measurement, Water costs, Pennsylvania, Water pollution control.
Identifiers: *Metering system, *Sewer charges, *Pittsburgh.

The metering system installed at the Westinghouse Research and Development Center in Pittsburgh, Pennsylvania which provided an accurate measure of sewage flow was described. The system involved metering incoming water and all water usage which did not go to sewer lines. In less than 2 years of operation, savings in sewer charges of over 30 percent per year have been realized. (Galwardi-Texas)
W72-13496

POLLUTION IN AREAS NEAR THE POMPANO BEACH SEWAGE OUTFALL,
Florida Atlantic Univ., Boca Raton. Dept. of Biological Sciences.
For primary bibliographic entry see Field 05B.
W72-13504

APPARATUS FOR CONFINING FLOATING MATERIALS,
E. E. Headrick.
U. S. Patent No. 3,662,891, 3 p, 5 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 898, No 3, p 871, May 16, 1972.

Descriptors: *Patents, *Oil pollution, *Oil spills, Pollution abatement, Equipment, Water pollution, Water pollution treatment, Flotsom, Liquid wastes.
Identifiers: *Booms.

A V-shaped boom is formed from a cluster of parallel elongated air and water tubes. They are flexible and insensitive to wave action. The arms lock the boom to the surface of the water preventing oil from being spilled over. A harness arrangement between the two arms has an intersecting pattern of cables crisscrossed between the arms. Wave attenuators at the apex of the V are disposed parallel to a line bisecting the boom angle to reduce the trochoidal velocity of waves. A controllable gate serves as a link between the boom and an oil collection container. The gate skims the oil and moves it into the container. (Sinha-OEIS)
W72-13522

ADJUSTABLE PONTOONS FOR AERATOR PLATFORM,
For primary bibliographic entry see Field 05D.
W72-13537

WORLD AND WATER IMPERATIVES: WORLD CITY OF THE FUTURE,
Doxiadis Associates, Athens (Greece).
C. A. Doxiadis.
Journal of the American Water Works Association, Vol. 62, No. 12, p 740-747, December 1970. 11 ref.

Descriptors: *City planning, *Water quality, *Water supply, *Water conservation, Pollution abatement, Research and development, Technology, Economics.
Identifiers: *Policy making, Water cycle.

To the many traditional problems which exist in the relationship between man and water should be added the new problems of pollution on a large scale. The most probable future for human settlements is one of a larger increase of population and energy per capita in the urban areas. In order to provide the quantity and quality of water needed for development, man must change his policies and programs. The quantity of water which is needed in relation to that which is possible to control and make available through the annual water cycle must be ascertained. A new conception of the water cycle is necessary, based not only on precipitation but on additional water which will be kept outside of the system of precipitation to be used for human purposes only. Water consciousness is a first need. A type of city design will emerge from this consciousness which will be oriented towards the preservation of water. Research is needed to increase knowledge, to predict the future, and to develop simulation models for the reestablishment of a better economic balance in the system of man, water and land. The creation of technologies on a simplified pattern is demanded. Many areas of the world can be saved by the use of the knowledge and the technologies which exist. Man should develop an attitude with which to look at the urgent problems of water resource development that will account for the overall problem of the evolution of man as a part of the biological system developed by nature on earth. (Strachan-Chicago)
W72-13549

WATER-CAPACITY PLANNING FOR METROPOLITAN AREAS - THE CASE OF MONROE COUNTY, N.Y.,
Rochester Univ., N.Y. Center for Naval Analyses.
For primary bibliographic entry see Field 03D.
W72-13550

THE TRUE COST OF WATER,
For primary bibliographic entry see Field 06C.
W72-13552

CRISIS IN MUNICIPAL WATER SUPPLIES,
Taylor and Smith, San Bernardino, Calif.
For primary bibliographic entry see Field 03D.
W72-13553

COMMITTEE REPORT: JOINT ADMINISTRATION WATER/WASTEWATER WORKS.
American Waterworks Association, New York. Committee for Water and Wastewater Operations.

Journal of the American Water Works Association, Vol. 63, No. 4, April 1971, p 199-202. 3 photo, 2 tab.

Descriptors: *Administration, *Water works, Waste water treatment, Rates, Political aspects, Financing, Decision making, Planning, Water treatment.
Identifiers: *Joint administration.

The joint administration of water and sewage facilities is discussed. The report is compared to a similar study made in June 1959. A questionnaire was mailed to 2,472 cities and water districts with a population of more than 10,000 with a 44% response. Trends and general opinions that may be a guide to avenues of investigation are presented. The feelings for some sort of joint administration, as expressed in 1959, prevail today. Difficulties within this system were identified as: maintenance of the separate identity of each service with particular concern that each service identify its own costs and respectively set its charges; and political hinderance of appreciable organizational changes. The most significant trends are: (1) the number and percentage of water and sewerage systems under joint administration are increasing, (2) the number and percentage of complete sewerage systems under joint administration are increasing, and (3) the number and percentage of cities utilizing the service charge for financing operations is increasing. The results are recommended as a basis on which to make the decision to choose joint or separate administration. (Strachan-Chicago)
W72-13554

POPULATION GROWTH AND NONINDUSTRIAL WATER POLLUTION,
C. H. Weidner.
In: Environmental Side Effects of Rising Industrial Output, Chapter 4, p 85-110, Heath Lexington Books, D.C. Heath and Co., Lexington, Massachusetts. 1970. 1 fig, 5 tab, 34 ref.

Descriptors: *Municipal wastes, Domestic wastes, *Sewage, Population, Technology, Sewage treatment, Demand, Feasibility, Cost-benefit analysis, Water utilization, *Water pollution control.
Identifiers: *Nonindustrial water pollution.

The principal component of nonindustrial water pollution is mass sanitary sewage disposal. Since the amount of sanitary sewage created is directly proportional to the urban population, the amount of potential water pollution should increase substantially in future years. Projections indicate that the 1980 urban population will be 47 percent greater than the 1960 urban population, while the 2000 urban population will be 114 percent greater than that of 1960. However, treatment technology is now more than adequate to treat sewage to whatever degree is desired. Unfortunately, high levels of treatment are very costly. Consequently, the future purity of our water will depend on the amount of concern the nation has for the pollution problem. If the present high level of public concern continues, our waterways should, in the future, be superior to their present condition, regardless of population increases. One reason public concern may remain at a high level is that water pollution has deleterious effects on many of water's uses, including recreation, agricultural reuse, industrial reuse, public water supply, and fishing. Consequently, the high costs of treatment may be more than offset by the benefits accruing to the users of clean water. (Settle-Wisconsin)
W72-13558

PRICING POLLUTION AND OTHER NEGATIVE EXTERNALITIES,
Ohio State Univ., Columbus. Dept. of Economics.
R. A. Tybout.
The Bell Journal of Economics and Management Science, Vol 3, No 1, p 252-266, Spring, 1972. 3 fig, 2 tab, 15 ref.

Descriptors: *Pollutants, *Compensation, *Legal aspects, Water pollution, Mathematical models, Optimization.
Identifiers: *Externalities, *Coase Theorem, Bribery, Legal responsibility.

The 'Coase Theorem' asserts that legal responsibility can be assigned to either the pollution originators or to those damaged without affecting the allocation of resources. Either way, it is held, the parties could negotiate a monetary settlement that would lead to identical waste output in the absence of transactions costs. However, the Coase Theorem breaks down in many circumstances. Consequently, the transaction for internalizing a negative externality such as upstream water pollution cannot, in general, run either way. Viable market operation requires that an internalizing payment must in general take the form of compensation running from the polluter to the damaged party. The model used in the analysis is the conventional one with two goods, two factors, two firms, and linearly homogeneous production functions. Prices are viewed parametricly by all parties, and the second-order conditions are those required for quasi-concavity. Under the constant returns to scale assumption, compensation leads to exhaustion of product whereas bribery does not. Only certain selected production functions can lead to positive aggregate profits in a bribe-paying industry. Related issues of the blackmail problem, third-party pricing, and public goods aspects are also analyzed. (Settle-Wisconsin)
W72-13559

COSTS AND QUALITY OF WATER IN OHIO CITIES,
Ohio State Univ., Columbus; Ohio Agricultural Research and Development Center, Columbus; and Ohio State Univ., Columbus. Dept. of Agricultural Economics and Rural Sociology.
M. H. Cosgrove, and L. J. Hushak.
Ohio Agricultural Experiment Station, Research Bulletin No 1052, April 1972. 16 p, 10 tab, 10 ref.

Descriptors: *Water supply, *Costs, *Regression analysis, *Municipal water, Estimated costs, Economies of scale, Operating costs, Fixed costs, Average costs, *Ohio, Water Pollution Control.
Identifiers: *Water systems, Cost functions, Cost parameters.

Cost functions for public water systems in Ohio cities are estimated. The general cost function used in the analysis posits total costs (capital and/or operating and maintenance costs) as a function of (1) output variables including quantity and quality characteristics, (2) water input variables, (3) treatment variables, and (4) input prices and other factors affecting costs. The cost parameters were estimated by ordinary least squares with operating and maintenance cost data from 79 Ohio cities. The estimates suggest that the marginal costs of water flow decline with increasing system size. However, the rate of decline is probably too small to make consolidation of water systems attractive unless the size of the consolidated system is several times as large as the individual systems. Furthermore, the estimated average cost equations indicate a large fixed component of operating expenses, thus making consolidation even more attractive for small systems. When the data is separated by source of water, a difference arises between the surface and ground water cost equations. However, this difference may be due either to specification problems from the data or to differences in the cost structures. (Settle-Wisconsin)
W72-13561

BENEFITS OR COSTS. AN ASSESSMENT OF THE WATER RESOURCES COUNCIL'S PROPOSED PRINCIPLES AND STANDARDS,
Resources for the Future, Inc., Washington, D.C.; George Washington Univ., Washington, D.C.; Johns Hopkins Univ., Baltimore, Md.; Wisconsin Univ., Madison; and Harvard Univ., Cambridge, Mass. Harvard Developmen t Advisory Service.
For primary bibliographic entry see Field 06B.
W72-13562

INSTANCES, IF ANY, WHERE COST/BENEFIT ANALYSIS HAS BEEN APPLIED TO ENVIRONMENTAL PROBLEMS, UNITED STATES.
National Air Pollution Control Administration, Washington, D.C.
For primary bibliographic entry see Field 06B.
W72-13563

PROBLEMS AND INSTRUMENTS RELATING TO THE ALLOCATION OF ENVIRONMENTAL COSTS.
Organization for Economic Co-operation and Development, Paris (France).

Organization for Economic Co-operation and Development, Paris, June, 1972. 33 p, 2 fig.

Descriptors: *Pollutants, *Environmental effects, *Costs, Pollution taxes (Charges), Taxes, Standards.
Identifiers: *Externalities, *Internalization, Subsidies, Economic theory, Applications.

The analysis of the principal methods of allocating environmental costs is divided into two main parts: (1) an overall analysis of the general problem of cost allocation, and (2) actual applications. THE FIRST SECTION IS SUBDIVIDED INTO (1) a statement of the problem, and (2) an economic analysis of the problem of cost allocation. The basic problem is one of internalizing environmental affects in economic mechanisms in order to ensure a rational allocation of costs. The basic instruments for solving this problem are compulsory standards, taxes, and subsidies. Concrete examples of how these instruments may be used are given in the second major section. The following three examples are discussed: (1) the French experience with allocating water resources by levying charges, (2) the Japanese experience with controlling air pollution through standards and tax abatements, and (3) the German experience with controlling the disposal of used oils through a tax-subsidy scheme. Pollution charges appear to satisfy the two-fold criteria of efficiency and equity in allocating water resources. Tax abatements, while probably helpful as a temporary measure, appear less efficient and equitable than pollution charges. (Settle-Wisconsin)
W72-13564

06. WATER RESOURCES PLANNING

6A. Techniques of Planning

AN ALGORITHM FOR OBTAINING OPTIMAL LOOPED PIPE DISTRIBUTION NETWORKS,
Parsons, Brinckerhoff, Quade and Douglas, New York. Water Resources Systems Group.
For primary bibliographic entry see Field 08A.
W72-13042

THE OAP REGIONAL ECONOMIC MODEL UTILIZATION. PHASE I. VOLUME I. SIMULATION AND ANALYSIS,
Consad Research Corp., Pittsburgh, Pa.
T. R. Lakshmanan, F. Lo, and R. Byrne.
Available from the National Technical Information Service as PB-207 319, $3.00 in paper copy, $0.95 in microfiche. Environmental Protection Agency, Research Triangle Park, North Carolina, Office of Air Programs, APTD-0946, January, 1972. 142 p, 17 fig, 30 tab, 4 append.

Descriptors: *Economic prediction, *Economics, *Air pollution, *Abatement, *Model studies, Regional economics, Economic impact, Estimated costs, Industries, Regressive taxes, Cost sharing, Benefits, Legislation, Computer programs, Bibliographies, Cost sharing, Water pollution control, Costs, Waste disposal, Solid wastes, Income, Industrial wastes, Administration, Water quality.
Identifiers: *Regional economic model, *Air pollution control, Incentives, Implemental strategies.

A regional economic model for assessment of the effects of air pollution abatement was demonstrated; it describes the economic system-wide effects of specific air pollution strategies in 91 regional metropolitan areas of the U.S. by encompassing (1) implementation strategies, (2) control costs and economic projections, (3) economic effects of selected strategies, (4) application to water pollution and solid waste disposal. A regional labor market block specifies employment, unemployment, and labor force equations, and describes the regional electricity and fuel demand patterns. The regional economics of different Air Quality Control Regions (AQCRs) respond to alternative implementation strategies with considerable sensitivity, as seen from five variables selected for analysis: manufacturing production (value-added), manufacturing investment, regional personal income, regional unemployment ratio, and regional government revenue. For example, increment in unemployment aggregated over the 91 AQCRs varies from 0.51% to 0.18%. Cost-sharing by the government is more effective than a two-year extension to the regional economy, e.g., the number of AQCRs which will face 0.5% or more increment in unemployment rate will drop from 32 to 20 AQCRs with a two-year extension from 1975 to 1977 while with 59% additional government financial assistance to the control cost the number will drop to 6 AQCRs. (Auen-Wisconsin)
W72-13072

IMPACT OF THE DECLINING WATER SUPPLY ON THE ECONOMY OF CURRY AND ROOSEVELT COUNTIES,
New Mexico State Univ., University Park. Dept. of Agricultural Economics and Agricultural Business.
For primary bibliographic entry see Field 04B.
W72-13078

A MODEL FOR OPTIMAL SALMON MANAGEMENT,
Washington Univ., Seattle. Fisheries Research Inst.
D. E. Booth.
Fishery Bulletin, Vol 70, No 2, p 497-506, April, 1972. 1 fig, 4 ref, 1 append.

Descriptors: *Salmon, *Fisheries, *Fish management, Profit, Sustained yield, Mathematical models, Theoretical analysis, Optimization.
Identifiers: *Discrete time model.

A discrete time profit maximizing model based on currently accepted views of biological spawner-return relationships for salmon is developed. The model's assumptions include (1) a linear homogeneous aggregate production function, (2) a spawner-return relationship exhibiting the usual properties of fishery recruitment functions, and (3) constant prices in all time periods. The objective function is the present worth of industry profits. First-order conditions indicate that the level of escapement should be selected in time period zero such that the incremental profitability of an additional fish caught today is just equal to the present value of the profitability of the future return resulting from an incremental spawner. There is no reason to anticipate in this model that

the initial run size will be at the desired level for a profit-maximizing equilibrium solution, and to reach the desired level may be costly. This analysis, however, ignores the question of optimal policy for reaching the equilibrium solution. Also, there is no reason to anticipate that the equilibrium solution will correspond to maximum sustained yield. (Settle-Wisconsin)
W72-13080

A GENERAL MODEL FOR EVALUATING AGRICULTURAL FLOOD PLAINS,
Texas A and M Univ., College Station; and Oklahoma State Univ., Stillwater.
R. D. Lacewell, and V. R. Eidman.
American Journal of Agricultural Economics, Vol 54, No 1, p 92-101, February, 1972. 4 tab, 13 ref.

Descriptors: *Floods, *Flood plains, *Mathematical models, *Evaluation, Optimization, Land use, Agriculture, Flood plain insurance.
Identifiers: *Flood damage estimating.

A model is developed that can be used to estimate flood damages by small tract for flood plains devoted to agricultural uses. The model uses the basic mechanics of the frequency method of flood damage estimation. However, computation of flood damages is based on a point sample method rather than the commonly used composite acre technique. The computational procedure uses data presently available in flood damage studies. An application of the model to the Nuyaka Creek flood plain in eastern Oklahoma illustrates that the disaggregated damage estimates, which the model employs, can be used to establish (1) more equitable assessments of the local costs of flood protection, (2) annual premiums for flood insurance, and (3) cropping patterns having the greatest return. Furthermore, this application indicates that the increase in expected net returns for appropriate land use changes exceeds the benefits of flood protection. Two criticisms of this model are evident. First, it considers only agricultural production; flood damages to buildings, fences, roads, and other improvements are not included. Second, land is the only resource constraint considered by the model in selecting optimum land use. (Settle-Wisconsin)
W72-13081

EXTERNALITIES AND THE BASIC THEOREMS OF WELFARE ECONOMICS,
Keio Univ., Tokyo (Japan). Dept. of Economics.
H. Osana.
Journal of Economic Theory, Vol 5, No 3, p 401-414, June, 1972. 7 ref.

Descriptors: *Theoretical analysis, *Welfare (Economics), *Mathematical models, Economics, Optimization.
Identifiers: *Competitive equilibrium, *Pareto optimum, *Externalities, Microeconomic theory.

The two basic theorems of welfare economics are shown to be valid under conditions characterized by a certain set of externalities. The first theorem, which asserts that a competitive equilibrium is Pareto optimal, requires strong conditions excluding almost completely the external effects in preference relations. This requirement suggests that the externalities in preference relations are great obstacles for a competitive process to achieve an optimal resource allocation. Technological externalities have less serious implications. If each economic agent thinks he can always do whatever is actually possible for him in attainable states, then a competitive equilibrium without externalities in preference relations is an optimum. The second theorem, which asserts that an optimum can be supported by a competitive price system with the appropriate redistribution of purchasing power, does not necessitate the absence of externalities in preference relations. It requires only the convexity of agents' judgments and the fair limitedness of information. This latter requirement says that the set of initial resources which agents think necessary to achieve a unanimously better state is included in the set of those which are actually necessary for such achievement. (Settle-Wisconsin)
W72-13082

ENVIRONMENTAL REPERCUSSIONS AND TRADE THEORY,
Michigan State Univ., East Lansing.
For primary bibliographic entry see Field 05G.
W72-13093

OPTIMIZATION MODEL FOR CHURCHILL RIVER DIVERSION,
Metcalf and Eddy, Inc., Boston, Mass.
For primary bibliographic entry see Field 04A.
W72-13134

MATHEMATICAL MODEL FOR RATE STUDIES,
Camp, Dresser and McKee, Boston, Mass.
For primary bibliographic entry see Field 05G.
W72-13135

AN APPLICATION OF NETWORK THEORY TO WATER MANAGEMENT IN POULTRY PROCESSING,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 05D.
W72-13137

AN 'OPTIMIZED MODULE' APPROACH TO WASTE WATER RECLAMATION DESIGN,
Kennedy Engineers, San Francisco, Calif.
For primary bibliographic entry see Field 05D.
W72-13138

OPTIMAL SEASONAL AND SHORT-TERM OPERATION OF A RESERVOIR USED FOR FLOOD CONTROL AND WATER SUPPLY,
Water Research Association, Marlow (England).
For primary bibliographic entry see Field 04A.
W72-13139

THE CHESAPEAKE BAY, REPORT OF A RESEARCH PLANNING STUDY,
Johns Hopkins Univ., Baltimore, Md.; Maryland Univ., College Park; and Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 06G.
W72-13165

SHIFTING LAND AND WATER USE IN THE BITTERROOT VALLEY, MONTANA,
Montana State Univ., Bozeman. Water Resources Research Center.
For primary bibliographic entry see Field 06B.
W72-13307

STREAMFLOW REGULATION BY ARTIFICIAL RECHARGE FED FROM UPSTREAM SURFACE STORAGE: DERIVATION OF CONTROL RULES,
Water Research Association, Marlow (England).
T. Wyatt, D. G. Thorn, and P. A. Mawer.
AIHS--IASH (International Association of Scientific Hydrology) International Symposium on Mathematical Models in Hydrology, Warsaw, Poland, July, 1971. 16 p, 7 fig, 4 ref.

Descriptors: *Dynamic programming, *Artificial recharge, *Streamflow, Regulation, Storage, Surface water, Groundwater, Aquifers, Constraints, Systems analysis, Mathematical models, Optimization, Simulation.
Identifiers: *Direct search methods, *Upstream surface storage, *Control rules.

Presented are two alternative methods of finding control rules for regulating streamflow using an on-channel surface store conjunctively with abstraction from and artificial recharge to an aquifer. The methodologies are based on dynamic programming and direct search methods. This study presents an example of the special case of regulation of a common streamflow by combined surface storage and artificial groundwater recharge, where the surface storage (on-channel) is upstream of the point of recharge abstractions. Upstream surface/downstream aquifer storage implies the need for operating rules to determine under what conditions it is necessary to abstract water from the aquifer to avoid excessive depletion of the surface store, and under what conditions it is necessary to recharge water to the aquifer to avoid its excessive depletion. Subject to these constraints, the objective is to minimize use of the aquifer, given that the operating costs of recharge/abstraction are higher than the costs of direct releases from the surface store. (Bell-Cornell)
W72-13356

INTERACTIVE COMPUTING IN WATER QUALITY MANAGEMENT,
Wisconsin Univ., Madison. Water Resources Center.
A. G. Merten, and C. H. Falkner.
Journal Water Pollution Control Federation, Vol 44, No 8, August, 1972. 11 p, 2 fig, 1 tab, 7 ref.

Descriptors: *Water quality, *Waste water (Pollution), *Waste water treatment, *Computer programs, Optimization, Algorithms, Mathematical models, Systems analysis, River flow, Temperature, Dissolved oxygen.
Identifiers: *Waste reduction.

An interactive computer program is described that is designed to generate solutions to the problem of determining the reduction in organic discharges to a river required at specified waste sources so that minimum dissolved oxygen levels are maintained. This interactive approach provides a method for investigating the stochastic nature of the problem, yields the problem solver much flexibility in performing sensitivity analyses on the solutions, and helps him gain insight into the role played by the individual waste sources and control points at which the quality of the river is measured. The program consists of over 20 commands which the problem solver can execute from a teletype to generate, test, compare, and store waste reduction solutions. The algorithm commands are used to find and modify solutions to specific constrained optimization problems which are described herein. (Bell-Cornell)
W72-13357

A STORAGE MODEL IN WHICH THE NET GROWTH-RATE IS A MARKOV CHAIN,
Michigan State Univ., East Lansing. Dept. of Statistics, and Probability.
P. J. Brockwell.
Journal of Applied Probability, Vol 9, No 1, p 129-139, March, 1972. 11 p, 14 ref.

Descriptors: *Markov processes, *Water storage, *Growth rates, Dams, Systems analysis, Mathematical models, Algorithms, Equations.

The distribution of the times to first emptiness and first overflow, together with the limiting distribution of content are determined for a dam of finite capacity. It is assumed that the rate of change of the level of the dam is a continuous-time Markov chain with finite state-space (suitably modified when the dam is full or empty). These methods used herein can also be applied to the case where the input data minus the demand rate takes constant values over time intervals which are indepen-

dently distributed with gamma distributions, provided the transitions from one rate to the next are governed by a Markov transition matrix. (Bell-Cornell)
W72-13358

A LINEAR PROGRAMMING FORMULATION OF A WATER SUPPLY PROBLEM,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Industrial Engineering and Operations Research.
K. E. Case, and J. A. White.
American Institute of Industrial Engineers, Vol. 4, No. 2, p 85-91, June 1972. 2 fig, 3 tab, 12 ref.

Descriptors: *Linear programming, *Water distribution, *Planning, Water supply, Water demand, Flow rates, Pressure, Pipes, Size, Head loss, Systems analysis, Mathematical models, Valves.
Identifiers: *Friction losses.

Presented is the problem of determining the minimum cost distribution system for supplying water to several demand centers having demand patterns which change over time. The objective is to minimize the present worth cost of the system, while maintaining flow rates at specified pressure and static heads at each demand center. The costs of the system are taken to be functions of the lengths of alternative pipe sizes used, as well as the friction losses produced by the flow of water. Linear programming is employed to determine the optimal lengths of each of the available pipe diameters and the magnitude of optimally inserted head loss required for equilibrium, using valves. The example problem is solved. (Bell-Cornell)
W72-13359

SOLUTION OF A WATER RESOURCES PROBLEM WITH ECONOMIES OF SCALE BY LINEAR PROGRAMMING,
Texas Water Development Board, Austin. Systems Engineering Div.
D. Salcedo, and A. O. Weiss.
Water Resources Bulletin, American Water Resources Association, Vol. 8, No. 3, p 546-552, June 1972. 9 fig, 2 tab, 2 ref.

Descriptors: *Linear programming, *Economies of scale, Optimization, Water resources, Planning, Computers, Algorithms, Mathematical models, Systems analysis, Water supply, Water demand.

Linear programming has gained wide acceptance with water resource planners because of its effectiveness and ease in use. While in certain cases integer or nonlinear techniques may appear better in terms of the final answer, linear programming generally proves to give accurate solutions while definitely being more workable. A method of using linear programming is presented for solving problems involving significant economies of scale. The specific problem, to which the method is applied, is structured to maximize net benefits derived from providing a water supply to a demand area, by building and operating a system of facilities where: (1) inflow can occur to each of the reservoirs; (2) there is a single import source; (3) operating costs are a linear function of quantity pumped; (4) returns are represented as negative operating costs in the final supply canal; (5) construction costs are a linear function of size except for a single canal facility; and (6) operating costs, as well as returns, are discounted and accumulated over the economic life of the project. (Bell-Cornell)
W72-13360

COMPUTER TECHNIQUES FOR WATER-DISTRIBUTION ANALYSIS,
Becher-Hoppe Engineers, Inc., Schofield, Wis.
A. E. Becher, Jr., G. J. Bizjak, and J. W. Schulz.
Journal American Water Works Association, Vol. 64, No. 7, p 410-417, July 1972. 1 fig, 4 tab, 15 ref.

Descriptors: *Water distribution (Applied), *Computer programs, *Analog computers, *Digital computers, Pipes, Networks, Systems analysis, Mathematical models.
Identifiers: *Distribution networks.

The state of the art in computing network performance is reviewed. Economic and technical comparisons are made of digital and analog computers, and detailed descriptions of their operational characteristics are given, in relation to the application of modern techniques and equipment to the analysis of pipe networks for water distribution systems. The problem of accurately analyzing the behavior of distribution networks is common to both the design of new water systems and the operation and rehabilitation of old ones. With today's high construction costs and the long-lasting character of available materials, it behooves designers to make accurate determination of required component sizes. It is concluded that use of the digital computer appears usually to be the most preferable from cost standpoint. Regardless of the selection of specific equipment or program, however, it is apparent that computer techniques offer the designer an essential tool in the planning of efficient, economical distribution systems. (Bell-Cornell)
W72-13361

6B. Evaluation Process

WATER RESOURCES MANAGEMENT: A CRITIQUE,
Ohio Dept. of Public Health and Welfare, Cleveland. Div. of Environmental Health.
B. Walker, Jr.
Am J Public Health. Vol 61, No 12, p 2354-2361. 1971.
Identifiers: Critique, *Management, *Water resources, Reviews, Federal government, State governments, Local governments.

A review of developments in the management of water resources in terms of administration, technical methods and financing is given. Federal, state and local levels are considered.--Copyright 1972, Biological Abstracts, Inc.
W72-13066

THE OAP REGIONAL ECONOMIC MODEL UTILIZATION. PHASE I. VOLUME I. SIMULATION AND ANALYSIS,
Consad Research Corp., Pittsburgh, Pa.
For primary bibliographic entry see Field 06A.
W72-13072

ECONOMICS OF WATER RESOURCES PLANNING,
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.
L. D. James, and R. R. Lee.
McGraw-Hill Book Company, New York, N.Y., 1971. 615 p, 3 append.

Descriptors: *Water resources, *Planning, *Economics, Resource allocation, Optimization.
Identifiers: *Project purposes, *Project feasibility, Multiple-purpose projects, Financial analysis.

Six major aspects of water resource economics are considered: (1) engineering economy, (2) microeconomics and efficient resource allocation, (3) planning in a real world setting, (4) economic planning by project purpose, (5) multipurpose water resources development, and (6) financial analysis. Under these general headings many particular topics are discussed. The principles of engineering economics and the basic mathematics of economic analysis are developed in the engineering economy section. In the microeconomics section, the simple analytics of microeconomics is developed and applied to the question of project optimality in particular and welfare economics in general. Various aspects of discounting are also considered. Benefit-cost analysis and the dynamics of project analysis are developed as part of the general planning problem. Particular planning problems considered are those associated with project purposes such as flood control, drainage, water supply, hydroelectric power, navigation, water quality control, recreation, and fish and wildlife enhancement. Various optimization techniques for solving the problems posed by multipurpose projects are outlined, and their implementation in a planning framework discussed. Finally, methods for assessing a project's financial feasibility, allocating costs among various project purposes, and pricing water resources are discussed. (Settle-Wisconsin)
W72-13073

FLOOD DAMAGE PREVENTION POLICIES,
Chicago Univ., Ill. Dept. of Geography.
For primary bibliographic entry see Field 04A.
W72-13074

AGRISYSTEMS AND ECOCULTURES, OR: CAN ECONOMICS INTERNALIZE AGRICULTURE'S ENVIRONMENTAL EXTERNALITIES,
Population Reference Bureau, Inc., Washington, D.C.
M. F. Brewer.
American Journal of Agricultural Economics, Vol 53, No 5, p 848-865, December, 1971. 1 tab, 4 ref.

Descriptors: Agriculture, Environmental effects, Forecasting, Demand, Supply, Prices, Management, Economic efficiency.
Identifiers: *Environmental quality.

The agricultural sector will face several problems in the coming decade. Trends evident in the production of food and fiber are (1) a movement to more extensive agriculture in an effort to reduce environmentally damaging capital inputs, (2) a continuing growth in agricultural export demand, (3) a possible shift toward a more vegetarian diet, and (4) increases in the number and importance of suburban area 'pick-it-yourself' farms. In a more general setting, there will be continued growth in several competing industries for what traditionally have been agricultural resources. For instance, increases in population, per capita income, mobility, and leisure time will significantly increase the land needed for recreational uses. Problems with which agricultural economists will have to contend include (1) how agricultural activities affect environmental quality, (2) determining the nature of demand functions for rural amenities, (3) developing production and cost functions for various types of agriculturally-related public services and their distribution, and (4) assessing agriculture's future needs for capital. Nine discussants analyze the paper's contributions. They point out, for example, that we also need more social knowledge concerning pollution problems and that more attention needs to be given to selection of correct policies. (Settle-Wisconsin)
W72-13075

THE PROFIT IN POLLUTION,
D. Thomas.
Management Today, p 70-78, 132, May, 1972. 5 fig.

Descriptors: *Pollution abatement, *Industrial wastes, *Profit, Legislation, Environmental effects.
Identifiers: England.

The experience of several British firms suggests that the prospects for the pollution control industry, while good, do not appear to be highly profitable. While recent legislation has no doubt increased the demand for pollution abatement services, rising costs will keep profits from increasing considerably. The pollution abatement industry is rapidly becoming capital-intensive, particularly in

the treatment and disposal of industrial effluent. Thus, it is unlikely that new entrants into the industry will succeed without the backing of larger, financially powerful firms. Even the scrap industry is tending toward capital-intensive operations, thus making it more difficult for new firms to profitably enter the industry. The rising costs of pollution control will be met by the larger businesses. However, it is the legions of medium-sized and small companies with their characteristically smaller profit margins that will be most affected by these cost increases. The capital costs of installing adequate control equipment may be punitive for them. Yet, the fines and prospects of imprisonment offer no better alternative. Some British industrialists are hopeful, nonetheless, that the pollution abatement industry can avoid pricing itself out of the range of the smaller firms. (Settle-Wisconsin)
W72-13076

PROJECT SELECTION AND MACROECONOMIC OBJECTIVES: A METHODOLOGY APPLIED TO PERUVIAN IRRIGATION PROJECTS,
Georgetown Univ., Washington, D.C. Dept. of Economics; and Iowa State Univ., Ames. Dept. of Economics.
S. E. McGaughey, and E. Thorbecke.
American Journal of Agricultural Economics, Vol 54, No 1, p 32-40, February, 1972. 1 fig, 6 tab, 15 ref.

Descriptors: *Irrigation programs, *Decision making, *Investment, Cost-benefit analysis.
Identifiers: *Goals, *Decision rule, *Objectives, Weights, Peru.

Development planning requires explicit specification of the major macroeconomic targets such as output, income distribution, employment, and balance of payments equilibrium. To achieve this specification, a method of obtaining investment priorities is formulated and applied to eleven Peruvian irrigation projects. The benefit-cost ratio and the social marginal productivity of investment were the investment criteria used to assess a project's contribution to the income objective. The effect on the balance of payments may be measured by either the ratio of the present value of the total balance of payments effects to the present value of project investment costs, or the foreign exchange-investment ratio. The employment goal may be assessed with the employment-investment ratio. Based on these criteria, a ranking function is formulated in ordinal and cardinal terms. This weighted linear function of the macro objectives can be used as a decision rule in the selection of projects according to their weighted contributions to the macro goals. This function appears to be a general device which can include as many objectives as there are suitable investment criteria. (Settle-Wisconsin)
W72-13077

A MODEL FOR OPTIMAL SALMON MANAGEMENT,
Washington Univ., Seattle. Fisheries Research Inst.
For primary bibliographic entry see Field 06A.
W72-13080

A GENERAL MODEL FOR EVALUATING AGRICULTURAL FLOOD PLAINS,
Texas A and M Univ., College Station; and Oklahoma State Univ., Stillwater.
For primary bibliographic entry see Field 06A.
W72-13081

WATER QUALITY CRITERIA FOR SELECTED RECREATIONAL USES-SITE COMPARISONS,
Illinois Univ., Urbana. Dept. of Physical Education.
R. Aukerman.
Ph.D. Thesis, 1971. 326 p, 35 fig, 36 tab, 30 ref, 3 append. OWRR B-034-ILL (2).

Descriptors: *Recreation facilities, *Water users, *Water quality, *Attitudes, Behavior, Recreation, Illinois.
Identifiers: Recreation sites, Beliefs, Criteria.

The study's major objective was to test the hypothesis that there are no differences among the selected study sites on respondent's attitudes, beliefs, and behavior concerning water characteristics. The study's methodology involved interviewing 606 adult users of nine Central Illinois water recreation sites. Analysis of the data suggests that there was indeed very little difference between the nine sites. Consequently, it appears to be unnecessary to develop water quality criteria for each lake in a region. Once the criteria are developed for one lake, they can be generalized to the other lakes in the region. Several secondary conclusions were also suggested by the study. First, while water quality is an important component of overall site perception, attractiveness of the site or a combination of other factors are more important. Second, the beliefs and attitudes of large numbers of people are being detrimentally affected by the quality of water at the site. Third, behavior of most site users is not strongly affected by water quality. Fourth, people can identify those variables which affect their beliefs, attitudes, and behavior. (Settle-Wisconsin)
W72-13084

ENGINEERING AND ECONOMIC IMPLICATIONS OF ICEBERGS IN THE NORTH ATLANTIC,
Memorial Univ. of Newfoundland, St. John's. Dept. of Engineering.
A. A. Bruneau, and R. T. Dempster.
In: Oceanology International 1972, Conference Papers, March 19-24, 1972, Brighton, England, The Society for Underwater Technology, p 176-180. 1972. 6 fig, 11 ref.

Descriptors: *Oil, *Icebergs, *Economic impact, Engineering, Exploration, Drilling, Operations, *Canada.
Identifiers: *North Atlantic.

The presence of moving and grounded or bottom dragging icebergs off the east coast of Canada poses serious problems in the development of offshore resources. As the cost of energy rises, the development of petroleum resources off the Canadian coast will become more and more profitable. Yet, any development project must cope with the icebertgs. These massive bodies of ice pose a clear threat to any operation lying in their paths, and if the safety of men and equipment involved is to be assured, some means must be developed to remove the risk of collision. Four alternative actions seem open to project operators. They might (1) develop a method for predictably deflecting icebergs from collision courses, (2) design the installation so that it can be readily moved out of the path of an iceberg, (3) strength the installation to ensure that it could withstand any conceivable collision, or (4) locate the operation in a place safe from the icebergs, such as on the sea bottom in a hardened site or depression. Each of these potential solutions has serious drawbacks which must be solved if they are to become practicable. (Settle-Wisconsin)
W72-13086

TOWARD AN ECONOMICS OF ECOLOGY,
For primary bibliographic entry see Field 06G.
W72-13087

EXTERNALITIES AND THE RACE FOR ECONOMIC GROWTH IN THE USSR: WILL THE ENVIRONMENT EVER WIN,
Wellesley Coll., Mass.
For primary bibliographic entry see Field 05G.
W72-13088

DELAYS RAISE COSTS OF WATER PROJECTS,
Texas Water Development Board, Austin. Operations Div.
For primary bibliographic entry see Field 06C.
W72-13089

ESTIMATION OF NET SOCIAL BENEFITS FROM OUTDOOR RECREATION,
Montana State Univ., Bozeman; and Missouri Univ., Columbia.
O. R. Burt, and D. Brewer.
Econometrica, Vol 39, No 5, p 813-827, September, 1971. 2 tab, 15 ref, append.

Descriptors: *Recreation demand, *Recreation facilities, *Real benefits, Recreation, Regression analysis, Estimating, Water resources development, *Missouri.
Identifiers: *Outdoor recreation demand, *Social benefits, Demand equations, Equation systems, Generalized least squares.

An economic framework is presented for measuring the net social benefits that can be attributed to development of a new outdoor recreation site, taking into consideration the influence that existing recreation developments have on the demand for services from the newly developed site. Initially, a model for measuring social benefits associated with a newly developed recreation site is presented, under the assumption that the system of demand equations for interrelated outdoor recreation sites is known. This method for estimating the social value of investments in outdoor recreation is shown to be commensurable with market value measures utilized in traditional cost-benefit analysis. The critical information required for the estimation of these demand equations is (1) the number of days the household spent at each category of recreation sites, including travel time, (2) expenditures incurred that were specific to each trip, (3) mileage driven on each trip, and (4) the family's income. Given this information, generalized least squares may be used to estimate the relevant parameters. The model is applied to six water recreation site groupings in Missouri. (Settle-Wisconsin)
W72-13091

SOCIO-ECONOMIC ACCOUNTING AND EXTERNAL DISECONOMIES,
Texas Univ., Arlington. Dept. of Accounting.
For primary bibliographic entry see Field 05G.
W72-13094

THE CHESAPEAKE BAY, REPORT OF A RESEARCH PLANNING STUDY,
Johns Hopkins Univ., Baltimore, Md.; Maryland Univ., College Park; and Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 06G.
W72-13165

PROPOSED BIG CYPRESS NATIONAL FRESH WATER RESERVE, FLORIDA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
National Park Service, Richmond, Va. Southeast Region.
For primary bibliographic entry see Field 06G.
W72-13224

THE INTERGRATION OF MULTIPLE OBJECTIVES IN URBANIZING WATERSHEDS,
North Carolina Water Resources Research Inst., Raleigh.
R. R. Wilkinson, Wayne Maynard, D. M. Mitchell, and J. W. Ranney.
Available from the National Technical Information Service as PB-211 615, $3.00 in paper copy, $0.95 in microfiche. UNC-WRRI North Carolina Water Resources Research Institute, Raleigh, Report No. 62, May 1972, UNC-WRRI-62-72, 65 p, 18 fig, 8 tab, 54 ref. OWRR-A-051-NC (1).

Descriptors: *Planning, Water resources development, *Urbanization, *Land development, *Land management, Land use, Small watersheds, *North Carolina, Decision making.
Identifiers: *Crabtree Creek Watershed, *Neuse River Basin, *North Carolina, Small watershed program, *Urban watersheds.

A generalized effort is used to describe and apply a development guidance system to an urbanizing watershed. Presently, the participants in the process operate within different spheres of interest and varying time frames. An essential objective is to identify a natural unit of the watershed as a focus for development that will permit the realization of objectives in a simultaneously integrated manner. The participants are real estate developers, public interest groups, a parks department and general city management concerned with public works and investment priorities. A development guidance system that will admit public interest groups to the decision process and adjust private developer's interests through granting premiums for environmental conservation is recommended.
W72-13303

SHIFTING LAND AND WATER USE IN THE BITTERROOT VALLEY, MONTANA,
Montana State Univ., Bozeman. Water Resources Research Center.
C. Hash, and H. Holje.
Available from the National Technical Information Service as PB-211 619, $3.00 in paper copy, $0.95 in microfiche. Montana Water Resources Research Center, Bozeman, Completion Report No. 3, (1972), 139 p, 4 fig, 19 tab, 70 ref, 3 append. OWRR-A-033-MONT (1).

Descriptors: Evaluation, *Economic impact, Third party effects, Economic feasibility, *Regression analysis, *Linear programming, *Institutional constraints, Montana, Model studies, *Land use, *Water utilization, Water distribution (Applied), Irrigation systems.
Identifiers: *Bitterroot Valley (Mont).

The rapid movement of land and water resources from agricultural to recreation-residential use in Montana's mountain valleys present both opportunities and problems to the residents to those areas--opportunities in the form of increased return to the resources of the area--problems in providing for a growing population without substantial increases in local tax rates and without creating the kinds of urban problems that so many come here to avoid. A multivariate regression model was used to analyze data on sales of unimproved tracts of land in the Bitterroot Valley area to determine the contribution to value of various amenities and detriments. A linear programming model of the resource economy of the Bitterroot Valley was used to evaluate the impact on local community well-being of certain policies to internalize some of the external costs of recreation-residential development. The present institutions and works for the distribution of irrigation water do not allow the waters available to Bitterroot Valley lands to be fully utilized in agriculture. The same linear programming model was used to estimate the impact of the agricultural economy of improvements in the irrigation water distribution system.
W72-13307

THE UTILIZATION OF ECONOMIC CRITERIA FOR THE EVALUATION OF ANGLING (VYUZITI EKONOMICKYCH KRITERII K HODNOCENI SPORTOVNIHO RYBOLOVU),
Prague Agricultural Univ. (Czechoslovakia). Dept. of Agricultural Economics.
J. Vacek, and J. Havelka.
Buletin VUR Vodnany, No 3, p 10-15, 1971. 2 fig, 5 ref. English summary.

Descriptors: *Fishing, *Recreation, *Evaluation, Fisheries, Sport fishing, Water utilization, Economics, Social needs, Social participation, C ost analysis.
Identifiers: *Czechoslovakia.

An introduction is presented to the prepared economic evaluation of angling and to the formation of a basis for the prospective evaluation of this 'hobby' activity by means of value categories. Only economic evaluation allows for the measurement and quantification of the importance of angling to society. The economic research of angling in Czechoslovakia should be focused on three interrelated fields: social aspects, hobbies and the psychological motivation of the spare-time activities; costs incurred in angling; and intensity of angling. The quatification of the dependencies existing among the different parts of angling is not only an important instrument for economic evaluation but it is also immediately connected with the method of the economic utilization of the fishing and angling districts. (Svensson-Washington)
W72-13349

SOLUTION OF A WATER RESOURCES PROBLEM WITH ECONOMIES OF SCALE BY LINEAR PROGRAMMING,
Texas Water Development Board, Austin. Systems Engineering Div.
For primary bibliographic entry see Field 06A.
W72-13360

WATER-CAPACITY PLANNING FOR METROPOLITAN AREAS - THE CASE OF MONROE COUNTY, N.Y.,
Rochester Univ., N.Y. Center for Naval Analyses.
For primary bibliographic entry see Field 03D.
W72-13550

INDUSTRIAL WATER FORECASTS,
Hazen and Sawyer, New York.
For primary bibliographic entry see Field 03E.
W72-13551

POPULATION GROWTH AND NONINDUSTRIAL WATER POLLUTION,
For primary bibliographic entry see Field 05G.
W72-13558

THE IMPACT OF PUBLIC WORKS SCHEMES ON FARMING: A CASE STUDY RELATING TO A RESERVOIR AND POWER STATION IN NORTH WALES,
University Coll. of Wales, Aberystwyth.
For primary bibliographic entry see Field 03F.
W72-13560

BENEFITS OR COSTS. AN ASSESSMENT OF THE WATER RESOURCES COUNCIL'S PROPOSED PRINCIPLES AND STANDARDS,
Resources for the Future, Inc., Washington, D.C.; George Washington Univ., Washington, D.C.; Johns Hopkins Univ., Baltimore, Md.; Wisconsin Univ., Madison; and Harvard Univ., Cambridge, Mass. Harvard Development Advisory Service.
C. J. Ciccetti, R. K. Davis, S. H. Hanke, R. H. Haveman, and J. L. Knetsch.
Johns Hopkins University, Baltimore, Maryland, Dept of Geography and Environmental Engineering, March, 1972. 18 p.

Descriptors: *Water resources development, *Cost-benefit analysis, *Evaluation, *Regional development, Economic efficiency, Cost sharing, Cost allocation, Discount rates, Standards, Regional analysis, Benefits, Costs.
Identifiers: *Water Resources Council, Double counting.

While the intent of the Water Resources Council's proposed 'Principles and Standards for Planning Water and Related Land Resources' is to improve benefit-cost practices, several of their proposals will facilitate the misuse of economic methods and result in a systematic bias toward overestimating benefits and underestimating costs of water resource projects. The shortcomings of several of the Council's proposed standards are discussed, and alternative standards are recommended. The discussion and recommendations are divided into six topics: (1) accounting concepts, (2) benefit measures, (3) cost allocation, reimbursement, and cost-sharing, (4) development versus preservation, (5) regional development, and (6) public participation. The Council's new multiple account framework is found to be unsound, and a unified national accounting framework should be adopted. The beneficiaries of water resource projects should normally be charged the full cost of the goods and services provided tham. The preservation of environmental resources should be recognized as a goal, and the irretrievable loss of such resources should be appropriately costed. An interest rate between nine and eleven percent should be applied to all new expenditures. Several other standards are also recommended. (Settle-Wisconsin)
W72-13562

INSTANCES, IF ANY, WHERE COST/BENEFIT ANALYSIS HAS BEEN APPLIED TO ENVIRONMENTAL PROBLEMS, UNITED STATES.
National Air Pollution Control Administration, Washington, D.C.

Organization for Economic Co-operation and Development, Paris, June, 1972. 60 p.

Descriptors: *Water pollution, *Air pollution, *Cost-benefit analysis, *Bibliographies, Pollutants, Environment, Evaluation.

This bibliography organizes publications in which cost-benefit analysis is applied to environmental problems in the United States. The bibliography is divided into the following two main topics: (1) the economics of air pollution, and (2) water pollution control. The air pollution section is organized according to (1) periodicals dealing with air pollution and other problems of environmental management (43 entries), (2) bibliographies and other sources of information (18 entries), (3) literature relating to benefit-cost analysis and economic theory (167 entries), and (4) recent literature relating to problems of environmental management (165 entries). The water pollution control bibliography is divided into the following five sections: (1) definition (19 entries), (2) benefit measurement or cost determination (12 entries), (3) evaluation techniques (15 entries), (4) decision criteria (6 entries), and (5) Federal Water Pollution Control Administration studies (4 entries). The water pollution control bibliography is annotated. (Settle-Wisconsin)
W72-13563

PUBLIC WATER RESOURCE PROJECT PLANNING AND EVALUATION: IMPACTS, INCIDENCE, AND INSTITUTIONS,
Wisconsin Univ., Madison. Dept. of Agricultural Economics; and Michigan State Univ., East Lansing. Dept. of Agricultural Economics.
D. W. Bromley, A. A. Schmid, and W. B. Lord.
Center for Resource Policy Studies and Programs, School of Natural Resources, Wisconsin University, Madison, Working Paper No 1, September, 1971. 1 fig, 3 tab, 41 ref, 1 append.

Descriptors: *Water resources development, *Evaluation, *Cost-benefit analysis, *Multiple-purpose projects, Institutions, *Planning, Benefits, Costs, Economics.
Identifiers: *Project impact.

The role of economic logic and method in analyzing the consequences of water resource investments is examined. The bargaining context within which federal water resource decisions are made is

found to be inadequate in three respects. First, the range of interests participating at the local level is too limited and tends to favor development-oriented groups. Second, the present system militates against a local realization that all federally-financed projects are mutually competitive with respect to the budget. Third, the present system does not facilitate the expression of nonlocal reaction to local programs. These shortcomings could be overcome to some extent with the adoption of an improved information display designed to (1) reveal the positive and negative impacts of proposed projects on all local and nonlocal interests, and (2) facilitate a national consideration and comparison of entire programs in terms of truly national objectives. The nature and incidence of project impacts are thoroughly discussed, and an accounting framework designed to reflect these project impacts is proposed. An appendix briefly discusses twelve issues of relevance to the evaluation of water resource projects, including effective demand, consumers' and producers' surplus, recreation benefits, flood control, project costs, and direct and indirect pecuniary effects. (Settle-Wisconsin)
W72-13565

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

ECONOMICS OF WATER RESOURCES PLANNING,
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.
For primary bibliographic entry see Field 06B.
W72-13073

FLOOD DAMAGE PREVENTION POLICIES,
Chicago Univ., Ill. Dept. of Geography.
For primary bibliographic entry see Field 04A.
W72-13074

THE PROFIT IN POLLUTION,
For primary bibliographic entry see Field 06B.
W72-13076

THE COST OF CLEAR WATER, VOLS I AND II.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 05D.
W72-13079

A GENERAL MODEL FOR EVALUATING AGRICULTURAL FLOOD PLAINS,
Texas A and M Univ., College Station; and Oklahoma State Univ., Stillwater.
For primary bibliographic entry see Field 06A.
W72-13081

TREATMENT-COST RELATIONSHIP FOR INDUSTRIAL WASTES,
Vanderbilt Univ., Nashville, Tenn.
For primary bibliographic entry see Field 05D.
W72-13083

CONSUMER WILLINGNESS TO PAY FOR POLLUTION ABATEMENT,
Guelph Univ. (Ontario).
For primary bibliographic entry see Field 05G.
W72-13085

DELAYS RAISE COSTS OF WATER PROJECTS,
Texas Water Development Board, Austin. Operations Div.
A. Eatman.
Water For Texas, Vol 2, No 3, p 4-7, March, 1972. 2 fig.

Descriptors: *Water resources development, *Costs, *Inflation (Economic), Dams, Spillways, Land, Relocation, *Texas.
Identifiers: Delays, *Palmetto Bend Reservoir (Tex).

The cost of anything bought by anyone is going to be more in the future than it is now. Consequently, delays in the construction of water resources development projects can be very costly. The United States Bureau of Reclamation estimates that between 1950 and 1972 the cost of canals increased by approximately 56 percent, the cost of dams rose by roughly 60 percent, and the cost of pumping stations increased by over 110 percent. The Palmetto Bend Reservoir project in Texas offers an example of the cost of waiting. In 1963 the estimated total cost of the project was $29,565,000. The component costs were estimated to be $3,470,000 for land, $8,040,000 for relocations, $12,000,000 for the dam and spillway, and $6,055,000 for other expenditures. Due to delays, the project was not undertaken, and by 1971 the estimated total cost had risen 76 percent to $52,085,000. The cost of land had risen 105 percent to $7,100,000; relocation expenses had increased 102 percent to $16,213,000; the cost of the dam and spillway had risen 46 percent to $17,464,000; and the cost of other items had risen 87 percent to $11,298,000. (Settle-Wisconsin)
W72-13089

FINANCING IRRIGATION,
For primary bibliographic entry see Field 03F.
W72-13090

THE ECONOMICS OF GEOTHERMAL POWER,
J. J. C. Bradbury.
In: Natural Resources Forum, United Nations, Dept. of Economic and Social Affairs, Vol I, p 46-54, 1971.

Descriptors: *Geothermal studies, *Steam, *Variable costs, *Fixed costs, *Operating costs, Exploration, Drilling, Pipelines, Operations.
Identifiers: *Geothermal power, *International cost comparisons.

In order to be a viable energy source, geothermal power must compete successfully with alternative energy sources such as natural gas, solid fuels, hydroelectric power, and nuclear energy. Consequently, before undertaking a geothermal power project, it is necessary to have the best possible estimates of not only probable exploration expenses, but also the costs of developing both well fields and power plants. The cost of exploration depends on such factors as geological structure, hydrology, and the depth and temperature of the production zone. Production-drilling costs are a function of several factors, including regional geological conditions, rock properties, drilling techniques, well design, and well depth. The cost of a fluid collection system in a geothermal field depends upon such factors as the mass flow, the steam-water ratio, and interference between adjacent wells. The variable costs associated with steam supply are very small and consist mainly of well and pipeline maintenance, which to a certain extent is a function of the corrosive nature of the geothermal fluid. Thus, the economics of geothermal power plants are dominated by comparatively high fixed charges and low variable costs. The costs associated with exploration, drilling, and operating in many parts of the world are quoted. (Settle-Wisconsin)
W72-13092

SOCIO-ECONOMIC ACCOUNTING AND EXTERNAL DISECONOMIES,
Texas Univ., Arlington. Dept. of Accounting.
For primary bibliographic entry see Field 05G.
W72-13094

MATHEMATICAL MODEL FOR RATE STUDIES,
Camp, Dresser and McKee, Boston, Mass.
For primary bibliographic entry see Field 05G.
W72-13135

AN APPLICATION OF NETWORK THEORY TO WATER MANAGEMENT IN POULTRY PROCESSING,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 05D.
W72-13137

OPTIMAL SEASONAL AND SHORT-TERM OPERATION OF A RESERVOIR USED FOR FLOOD CONTROL AND WATER SUPPLY,
Water Research Association, Marlow (England).
For primary bibliographic entry see Field 04A.
W72-13139

REGIONAL ADMINISTRATION AND FINANCING OF THE BALTIMORE WATER SYSTEM.
Booz, Allen and Hamilton, Inc., Washington, D.C.
For primary bibliographic entry see Field 06D.
W72-13166

ON MARYLAND'S ENVIRONMENTAL SERVICE,
For primary bibliographic entry see Field 06E.
W72-13256

AN ANALYSIS OF THE DEMANDS FOR WATER FROM THE PRIVATE SECTOR IN A SUB-ARCTIC URBAN AREA,
Alaska Univ., College. Inst. of Water Resources.
R. C. Haring.
Available from the National Technical Information Service as PB-211 610, $3.00 in paper copy, $0.95 in microfiche. Institute of Water Resources Report No. IWR-22, April 1972. 71 p, 1 fig, 9 tab, 131 ref. OWRR B-003-ALAS (1). 14-01-0001-872.

Descriptors: Water costs, Alternative costs, Water distribution (applied), Economic feasibility, Groundwater, Management, Pricing, Cold regions, *Alaska, *Water utilization, Water wells, Water supply, *Cities.
Identifiers: *Fairbanks (Alas), *Sub-arctic urban areas.

Problems of water use in the Fairbanks North Star Borough of Alaska, a typical urban-rural area in a sub-arctic climate, are described. Water use characteristics of various segments of the local economy, water policy practice and the pricing and costs associated with various types of water use are discussed. The research indicated a gradual expansion of water consumption and requirements for an increased rate of public and private investment in facilities. The water supply system of this sub-arctic city appears to be unusually complicated compared to those of other U.S. cities. These complications seem to stem from a naturally poor condition of the water supply and associated distribution problems caused by the cold climate. Additional complications result from a rather ambiguous utility and water regulation and use policy. The research work concludes that there will be a small water consumption growth in the future but increased demand for production and distribution facilities; the risks of health and financial loss due to well drilling uncertainty are indirectly borne by individual households; public and private investments in water production and distribution facilities overlap in some areas and do not exist in others this fact represents an unfortunate void in urban planning of the area; and, finally, quality of water supply is a very real and significant development problem for sub-arctic urban areas. The costs of water for human consumption and industrial use are substantial both in initial capital costs

and in continuing high maintenance costs. (Carlson-Alaska)
W72-13298

METERING SYSTEM TAKES THE WASTE OUT OF SEWAGE COSTS,
Westinghouse Electric Corp., Pittsburgh, Pa.
For primary bibliographic entry see Field 05G.
W72-13496

PULLING EFFLUENTS INTO LINE.
For primary bibliographic entry see Field 05D.
W72-13498

THE TRUE COST OF WATER,
E. F. Spitzer.
Journal of the American Water Works Association, Vol. 63, No. 6, June 1971, p 325-328. 2 photo.

Descriptors: *Water costs, *Water rates, *Water supply, Utilities, Pricing, Water pollution, Economics, Planning.
Identifiers: *Water study, Questionnaries, High rate area, Economic development, Rate increase.

The questions asked and conclusions made in a study of water-rating procedures of water utilities in the US are discussed. The objective of the study, which was made for the Office of Saline Water by The American City, was to identify water supplies serving 1,000 or more people, whose prices exceeded the study criterion of $7.50 for 10,000 gal in one month. Questionnaires were originally sent to 10,466 utilities, with a 55% return. Rates were found to be higher than expected. No section of the country was found to be immune to high rates. It is not the semiarid states which have the largest number of high rate areas. The three highest states are Kentucky, Tennessee, and West Virginia. It is suggested that the high water rates have retarded the economic development of these states. Most of the high rate areas are located in water-plentiful states, not in areas of relative water scarcity. High rate areas are those with small populations served. There is little rate variation between metropolitan and nonmetropolitan areas. Half of the high rates are four years old or less; about one third of the high rates date between 1960 and 1965; and the oldest high rate dates back to 1930. 47% of the utilities said that their rates would increase within the next five to ten years. Only 1.4% of these utilities expecting increases stated additional water treatment for water pollution as a cause for the increase. A number of the utilities stated that they would need an additional supply of water within the next five to ten years. (Strachan-Chicago)
W72-13552

COMMITTEE REPORT: JOINT ADMINISTRATION WATER/WASTEWATER WORKS.
American Waterworks Association, New York. Committee for Water and Wastewater Operations.
For primary bibliographic entry see Field 05G.
W72-13554

PRICING POLLUTION AND OTHER NEGATIVE EXTERNALITIES,
Ohio State Univ., Columbus. Dept. of Economics.
For primary bibliographic entry see Field 05G.
W72-13559

COSTS AND QUALITY OF WATER IN OHIO CITIES,
Ohio State Univ., Columbus; Ohio Agricultural Research and Development Center, Columbus; and Ohio State Univ., Columbus. Dept. of Agricultural Economics and Rural Sociology.
For primary bibliographic entry see Field 05G.
W72-13561

BENEFITS OR COSTS. AN ASSESSMENT OF THE WATER RESOURCES COUNCIL'S PROPOSED PRINCIPLES AND STANDARDS,
Resources for the Future, Inc., Washington, D.C.; George Washington Univ., Washington, D.C.; Johns Hopkins Univ., Baltimore, Md.; Wisconsin Univ., Madison; and Harvard Univ., Cambridge, Mass. Harvard Development t Advisory Service.
For primary bibliographic entry see Field 06B.
W72-13562

PROBLEMS AND INSTRUMENTS RELATING TO THE ALLOCATION OF ENVIRONMENTAL COSTS.
Organization for Economic Co-operation and Development, Paris (France).
For primary bibliographic entry see Field 05G.
W72-13564

ECONOMICS OF PUMPED STORAGE IN NEW ENGLAND,
Alexander Kusko, Inc., Needham Heights, Mass.; and Massachusetts Ins. of Tech., Cambridge, Mass.
For primary bibliographic entry see Field 04A.
W72-13567

ECONOMIC ANALYSIS OF SWISS PUMPED STORAGE SCHEMES FOR VARIOUS PARAMETERS OF OPERATION AND ENERGY COSTS,
Maggia, Locarno (Switzerland).
For primary bibliographic entry see Field 04A.
W72-13568

6D. Water Demand

A WIDE-AREA INVESTIGATION OF WATER UTILIZATION--PRIMARY REPORT.
Ministry of Construction, Tokyo (Japan). River Bureau.

Japan Ministry of Construction Publication, April 1971. 30 p, 13 fig, 1 map, 8 tab.

Descriptors: *Water resources development, *Water supply, *Water demand, *Projections, Foreign countries, Hydrologic data, Data collections, Streamflow, Water yield, Dams, Costs, Social aspects, Economics, Flood control, Reservoirs, Water storage, Water utilization.
Identifiers: *Japan.

Results of water resources investigations in Japan are presented, including a projection for water demand and supply in 1985. In estimating the balance between the supply and the demand, changes in economic and social factors are considered. According to the estimations, approximately 46 cu km of water consumption anticipated from 1966 to 1985 will depend on river surface waters. The construction of approximately 480 dams and other similar facilities will be required for this purpose, and the amount of funds required, including expenditure for flood control, will be approximately 7 trillion yen. The utilization rate of major rivers in the country in 1985 will reach a level of 50% to 60%. (Woodard-USGS)
W72-13054

WATER QUALITY CRITERIA FOR SELECTED RECREATIONAL USES-SITE COMPARISONS,
Illinois Univ., Urbana. Dept. of Physical Education.
For primary bibliographic entry see Field 06B.
W72-13084

ESTIMATION OF NET SOCIAL BENEFITS FROM OUTDOOR RECREATION,
Montana State Univ., Bozeman; and Missouri Univ., Columbia.
For primary bibliographic entry see Field 06B.
W72-13091

GENERAL PLAN 2020, LAND USE GUIDE FOR WATER, WASTE WATER AND DRAINAGE ENGINEERING STUDIES, MID-HUMBOLDT COUNTY URBAN PLANNING PROGRAM.
Baruth and Yoder, Walnut Creek, Calif.

Available from the National Technical Information Service as COM-72-10367, $3.00 in paper copy, $0.95 in microfiche. Humboldt County Planning Commission, Eureka, California, April 1971. 214 p, 46 fig, 83 tab, 5 ref. HUD Contract LPO-P/360-CAS-1.

Descriptors: *Planning, *Comprehensive planning, *Land use, *Water resources development, *Water supply development, *Drainage systems, Land development, Water supply, Drainage, Water conveyance, Long-term planning, Urbanization, Community development, Regional analysis, California.
Identifiers: *Humboldt County (California).

A general land use guide is presented which serves as a basis for subsequent water, wastewater and drainage studies. It is not a precise document for detailed plans. The study area is the western portion of mid-Humboldt County, extending 34 miles along the Pacific Coast and about 15 miles inland. The population of the area is expected to change from the present 79,590 persons to 321,000 by 2020. This expected increase is attributed to new jobs in the tourist and manufacturing industries, migration from metropolitan centers, and adoption of 'second' homes by many people. About 71,000 housing units must be added by 2020 in urban areas and about 20,000 in rural areas. Major transportation in the future emphasizes full construction of Highways 101 and 299, and a freight railway connection to the Valley. Airport development is encouraged with lands around airports to be planned and zoned with the noise factor being given full consideration. Gas and electricity supply will meet expected needs. A policy framework is needed to shape the short-range and long-range land use development around Humboldt Bay. (See also W72-13161 and W72-13162) (Poertner)
W72-13160

WATER SUPPLY, TREATMENT AND DISTRIBUTION, MID-HUMBOLDT COUNTY URBAN PLANNING PROGRAM.
Baruth and Yoder, Walnut Creek, Calif.

Available from the National Technical Information Service as COM-72-10375, $3.00 in paper copy, $0.95 in microfiche. Humboldt County Planning Commission, Eureka, California. 166 p, 30 fig, 72 tab, 25 ref. 1971. HUD LPO-P/360-CAS-1.

Descriptors: *Water supply development, *Planning, *Regional analysis, *Municipal water, *Water conveyance, Financing, Urbanization, Water resources development, Water treatment, Water supply, Water management (Applied), Administration, Water requirements, Water demand, California, Comprehensive planning, Water reuse.
Identifiers: *Humboldt County (California), Long-term planning.

Results are reported of a study aimed at developing long-range plans for water supply, treatment and distribution for the western mid-portion of Humboldt County, extending 34 miles along the northern California coast. A dominant feature of the area is Humboldt Bay, which is 14 miles long and up to 5 miles wide. Another striking geographical feature is the Mad River, whose drainage basin stretches almost 100 miles inland and whose discharge enters the ocean 5 miles north of the bay. The possible alternative sources of water in the area include surface waters, groundwater and reclaimed wastewater. Based on the expected

yield from each of these sources, it is apparent that surface waters will continue to be the prime supply source for the area. Based upon previous investigations and upon the information developed in this study, it is recommended that the Butler Valley Project be relied upon as the primary source of supply for municipal and industrial purposes for the entire Study Area. It is recommended also that groundwater continue to be used for agricultural purposes and that treated waste water be investigated as a supplement for the industrial water needs on the Samoa Peninsula. Also, the Humboldt Bay Municipal Water District should become the water purveyor for the entire Study Area. Plans for water distribution and storage facilities were developed using the electronic network analyzer for each of the major communities within the Service Areas. In many cases, alternative systems were evaluated and recommendations as to the best alternative were made. Financing is also discussed. (See also W72-13160) (Poertner)
W72-13161

REGIONAL ADMINISTRATION AND FINANCING OF THE BALTIMORE WATER SYSTEM.
Booz, Allen and Hamilton, Inc., Washington, D.C.

Regional Planning Council, Baltimore, Maryland, June 15, 1969. 106 p, 4 tab.

Descriptors: *Administration, *Financing, *Cities, *Water supply, *Planning, Water demand, Water distribution, Water management, Water conveyance, Maryland, Urbanization.
Identifiers: *Baltimore (Maryland), *Regional planning.

With the present Baltimore Water distribution system already inadequate, future demand estimated at three times the present demand promises to pose serious problems. Alternative solutions are presented to the administrative and financial problems of satisfying this future demand. Recognizing that a regional approach must be used to satisfy all communities involved, alternate methods are described. These are (1) an improvement to the present agreement process between local units of government, (2) a regional water authority, (3) a public corporation, (4) a city-county water authority, selling water to counties outside Baltimore County, (5) a state administration and/or financing of the water system, (6) a quasi-judicial regulatory body and (7) miscellaneous, complex arrangements. It is recommended that a plan embodying a regional approach be adopted and implemented quickly. (Poertner)
W72-13166

FACTORS PERTINENT TO WATER QUALITY IN THE ALBUQUERQUE METROPOLITAN AREA,
Albuquerque Urban Observatory, N. Mex.
C. L. Beckel.
Available from the National Technical Information Service as PB-208 122, $3.00 in paper copy, $0.95 in microfiche. November 1970. 77 p, 4 fig, 3 tab, 11 ref. HUD H-987.

Descriptors: *Municipal water, *Water quality, *Water supply, *Planning, *Decision making, *Water supply development, Potential water supply, Dependable supply, Groundwater potential, Groundwater availability, Groundwater resources, Cities, Urbanization, Local governments, New Mexico.
Identifiers: *Albuquerque (N.M.).

This manual contains facts pertinent to water quality in the Albuquerque area that may be useful to administrators in making decisions affecting water quality. The focus is on the problems associated with the Albuquerque metropolitan area's water supply and waste water, and additional problems such as flood control, as they relate to these two primary areas of focus. The report contains: a detailed tabulation of pertinent legislative authority; a description of some actual administrative procedures; a review of geological and geograph factors; a summarization of current master plans; a description of equipment, personnel, and personnel training; and a listing of funding and advisory sources. Over 50 governmental agencies have jurisdiction over water quality in the metropolitan area, although the authority and responsibilities of the departments of the City of Albuquerque are not spelled out in City ordinances. There appears to be no problem with regard to the quantity of available water for municipal use; however, the quality characteristics of the available water supply at depths appreciably below present pumping levels is virtually unknown. Many private water supply and waste disposal systems in the area pose a current health threat to their users. Effluent from Albuquerque waste treatment plants presently meets Stream Standards but not Effluent Standards. (Poertner)
W72-13168

AN APPROACH TO THE REGULATION OF WATER USE IN MANUFACTURING: A STUDY OF NORTH GEORGIA INDUSTRIES,
Indiana State Univ., Terre Haute.
J. R. McGregor.
In: Indiana Academy of the Social Sciences Proceedings, 1971, Third Series, Vol VI, p 64-78, Indiana State University, Terre Haute. 9 tab, 12 ref. OWRR A-014-GA (3).

Descriptors: *Industrial water, *Water utilization, *Water allocation (Policy), *Georgia, Water policy, Water supply development, Water requirements, Water conservation, Water demand, Administration, Regional analysis, Planning, Decision making, Industrial production, Competing uses, Equitable apportionment.
Identifiers: *Regulating water use.

A survey was made of water usage by various manufacturing companies representative of forty-four manufacturing industry types in northern Georgia. Information was obtained by personnel contact with Company representatives in 107 interviews and completed questionnaires returned by 322 of the 805 companies contacted by mail. Five distinct categories of the area's industries were established based upon the 'per employee annual intake' water requirements by four-digit S.I.C. industries. These varied from 9,000 gallons/year to 300,000 + gallons/year per employee. On the basis of these results it would seem that manufacturing industries logically could be classified in terms of their overall water requirements. The quantity of intake water clearly relates to the pattern of water use and to requirements for on-site intake and waste water treatment in the sample of industries considered. Three groupings of industries were found to differ substantially in their water requirements. These were Category I (1 to 10 thousand gallons/day), Category II (10 to 100 tg/d) and Categories III-V (more than 100 tg/d). Recognition of such differences in industrial water requirement characteristics would seem to be fundamental to rational area planning for industrial water use and therefore the groupings should have practical value. The group including Category I required relatively small volumes of intake water and could normally utilize existing municipal supply and treatment facilities without creating or adding to local water resource difficulties. The group of industries of Category II, while not usually problem industries, could create additional difficulties in areas presently having water problems. (Poertner)
W72-13171

CALIFORNIA WATER PROJECT,
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 04A.
W72-13259

DESALTING,
National Water Commission, Arlington, Va. Engineering and Environmental Div.
For primary bibliographic entry see Field 03A.
W72-13354

6E. Water Law and Institutions

WATER QUALITY STANDARDS SUMMARY FOR INTERSTATE WATERS OF THE DISTRICT OF COLUMBIA.
District of Columbia Dept. of Public Health, Washington. Water Quality Control Div.
For primary bibliographic entry see Field 05G.
W72-13049

WATER RESOURCES MANAGEMENT: A CRITIQUE,
Ohio Dept. of Public Health and Welfare, Cleveland. Div. of Environmental Health.
For primary bibliographic entry see Field 06B.
W72-13066

AWWA STANDARD FOR DEEP WELLS.
American Water Works Association, New York.
For primary bibliographic entry see Field 08B.
W72-13150

INSTITUTIONAL CHARACTERISTICS OF WATER MANAGEMENT IN MEDIUM-SIZED METROPOLITAN AREAS,
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.
G. E. Willeke, and F. W. Kroeck.
Paper presented at the Annual Water Resources Meeting of the American Society of Civil Engineers, January 24, 1972. 12 p. OWRR B-38-GA (1).

Descriptors: *Administration, *Administrative agencies, *Local governments, *Cities, *Legislation, *Zoning, Institutional constraints, Political aspects, Organizations, Water policy, Urbanization, Governments, Institutions, Water resources development.
Identifiers: Subdivision regulations.

Research in progress is reported on the management of water resources in medium-sized metropolitan areas. Included are the functions of water supply, provision of storm and sanitary sewers, waste water treatment, flood damage reduction, and water-oriented recreation. The purpose is to determine what is happening, what the problems are, what are the good aspects of water management, and what could be done to improve the situation. Two issues are covered: (1) land development control ordinances (zoning and subdivision regulations) and (2) government reorganization. Attention was given particularly to those characteristics that are distinctive, or that local officials believe are distinctive, in each jurisdiction and entity. It is hypothesized that major improvements in water management won't be made unless these distinctive features are given explicit attention. Institutional characteristics considered include: the participants; the kinds of problems faced in water management; the values and priorities of water managers and general influentials that shape water management; and the organization and administration of local governments. People seem to presume that the objectives of water management are well known and the solutions are not, whereas the opposite is more likely the case. The apparent removal of water management functions from the political arena has also inhibited the responsiveness of water managers to changing needs of society. Economic efficiency is not a high priority goal of water management, as compared to the goals of fiscal soundness, organizational viability, and equity in water rates and provision of service. (Poertner)
W72-13169

WATER AND AIR QUALITY REPORTING ACT.

N.C. Gen. Stat. secs. 143-215.63 thru 143-215.69 (Supp. 1971).

Descriptors: *North Carolina, *Legislation, *Monitoring, *Control systems, *Water quality control, State governments, Air pollution, Penalties (Legal), Regulation, Legal aspects, Water pollution, Water management (Applied), Data transmission, Measurement, Operations.

The Water and Air Quality Reporting Act of 1971 requires specified persons to file reports with the Board of Water and Air Resources detailing the discharge of waste and air contaminants into the waters and outdoor atmosphere and to establish and maintain approved systems for monitoring the quantity and quality of such discharges and their effects. The Act details the method to be used in monitoring and filing reports. No person subject to these provisions shall willfully cause or allow the discharge of any wastes or air contaminants into a waste disposal system or air cleaning device in excess of the capacity of the disposal system or device or any wastes or air contaminants which the disposal system or cleaning device cannot adequately treat. The Board is authorized to adopt report forms and such rules and regulations as are deemed necessary. Violation of the Act on implementing regulations shall constitute a misdemeanor subject to a fine of $100-$1000 for each violation and each day such person shall fail to comply after having been officially notified by the Board shall constitute a separate offense subject to the foregoing penalty. (Widman-Florida)
W72-13204

FLOODWAY REGULATION.
N.C. Gen. Stat. secs. 143-215.51 thru 143-215.61 (Supp. 1971).

Descriptors: *North Carolina, *Legislation, *State governments, *Floodways, *Regulation, Adoption of practices, Flood routing, Water management (Applied), Penalties (Legal), Obstruction to flow, Administrative agencies, Flood plains, Legal aspects, Comprehensive planning, Permits, Water law.

The purpose of this Part is to specify a means for regulation of artificial obstructions in floodways by responsible local governments. It defines relevant terms, prohibits artificial obstruction in delineated floodways, and enumerates uses of the floodway which may be made as a matter of right without a permit. Existing artificial obstructions shall not be considered in violation of this Part. Provisions are made for delineation of floodways, powers of the Board of Water and Air Resources, powers of local governments, and procedures to be followed in issuing permits. Any violation of this Part shall constitute a misdemeanor or result in appropriate civil actions. The granting of a permit under the provisions of this Part shall be construed as an added requirement if other approvals are required. No action for damages sustained because of injury caused by an obstruction for which a permit has been granted under this Part shall be brought against the State or any of its political subdivisions, or their employees or agents. This Part shall not preclude other regulations in the interest of flood plain management by responsible local governments. (Widman-Florida)
W72-13205

NATURAL AND SCENIC RIVERS ACT.
N.C. Gen. Stat. secs. 113A-30 thru 113A-43 (Supp. 1971).

Descriptors: *North Carolina, *Legislation, *State governments, *River systems, Administrative agencies, Governmental interrelations, Regulation, Easements, Water management (Applied), Conservation, Adoption of practices, Law enforcement, Land use, Rivers, Comprehensive planning, Penalties (Legal).

The Natural and Scenic Rivers Act of 1971 initially provides a declaration of policy, declaration of purpose, and definitions of terms used, then enumerates the types of rivers eligible for inclusion in the North Carolina natural and scenic rivers system and the criteria for inclusion. The Act: (1) delegates responsibility for administration and control of the system, acceptance of federal grants, additions to the system, and the promulgation of regulations for carrying out the provisions of the Act; (2) provides a method for raising the status of an area or of acquiring land; (3) determines the effect of contributions or gifts of easements on claims and allowances for charitable deductions; and (4) provides for integration of this system into any state park, wildlife refuge, state-owned area, or the national wild and scenic river system. Both civil actions and criminal penalties are available to enforce the provisions of the Act. The Department of Administration is authorized to advance from land-purchase appropriations necessary amounts for the purchase of lands in those cases where reimbursement will be later effected by the Bureau of Outdoor Recreation of the United States Department of the Interior. (Widman-Florida)
W72-13206

DEPARTMENT OF WATER AND AIR RESOURCES. ORGANIZATION AND POWERS; CONTROL OF POLLUTION. RIGHT OF WITHDRAWAL OF IMPOUNDED WATERS,
N.C. Gen. Stat. secs. 143-215.8, 143-215.44 thru 143-215.50 (Supp. 1971).

Descriptors: *State governments, *IMmpounded waters, *North Carolina, *Legislation, *Withdrawal, Legal aspects, Penalties (Legal), Water management (Applied), Consumptive use, Water utilization, Adoption of practices, Exploitation, Law enforcement, Public rights, Regulation, Water law.

Injunctive relief may be sought to restrain violation of this Article and for such other relief as the court deems proper. A person who lawfully impounds water for the purpose of withdrawal shall have a right of withdrawal of the excess volume of water attributable to the impoundment. A person with a right of withdrawal may assign or transfer it in whole or in part. The assignee or transferee has an interest in water superior to other interests only to the extent that his withdrawal is in accordance with the terms of the assignment or transfer. A person may exercise his right of withdrawal directly from the impoundment, from a watercourse below the impoundment, or both provided this does not require any other person to incur additional capital expenditures. Neither a right of withdrawal nor any assignment or transfer of said right may be asserted in defense against certain enumerated claims. A determination by the Board as to rate of flow based on either statutory method shall be prima facie correct. A person may assert his right of withdrawal when its use is specified by statute as well as in other circumstances. (Widman-Florida)
W72-13207

VERDUN V. SCALLON BROS. CONTRACTORS, INC. (APPROPRIATION AUTHORITY OF LEVEE DISTRICT).
255 So.2d 808-816 (La. Ct. App. 1971).

Descriptors: *Louisiana, *Riparian land, *Judicial decisions, *Eminent domain, Legal aspects, Levees, Administrative decisions, Administration, Administrative agencies, Riparian rights, Levee districts, Easements, Prior appropriation, Navigable waters, Appropriation.

Plaintiff riparian owners sued to enjoin defendant corporation and intervenor levee district from expropriating its encumbered land for the purpose of repairing a break in a nearby levee. The land in question, bordering a navigable water, was encumbered by a servitude because of its riparian nature when the levee was built in 1934. Compensation was duly made at that time. Plaintiffs contended that the instant attempt to expropriate the land was beyond the authority of the intervenor; that prior appropriation did not vest title in the intervenor; and, in the alternative, that plaintiffs should be paid for the expropriation. Defendants argued that the land was still encumbered with the servitude. The Louisiana Appellate Court held that a servitude created by law remained in effect as long as the land was riparian. Where plaintiffs' land was farther away than other lands within the servitude, the failure to appropriate lands closer to the levee was not deemed an abuse of intervenor's authority. The court further held where there is other available land the burden rested on the plaintiffs to establish the economic and technological necessity for appropriating the other land. In dissolving the lower court injunction granted plaintiffs, the appellate court declared that the authority to exercise the right of appropriation is bound by the reasonable necessities of the situation and that the Levee Board had not abused such reasonableness. (Ilkson-Florida)
W72-13208

OFFSHORE DRILLING--THE COMING BATTLE,
House, Washington, D.C.
M. Harrington.
Congressional Record, Vol. 118, p E5781-E5782 (daily ed.) May 25, 1972.

Descriptors: *Oil industry, *Well drilling, *Oceans, *Environmental effects, Offshore platforms, Exploration, Power marketing, Economics, Electric power demand, Water pollution sources, Oil spills, Oil pollution, Disasters, Energy, Technology, Research and development, Projects, Political aspects.
Identifiers: *Oil import quotas.

The proposed plan by the Nixon administration to initiate offshore oil development on the Atlantic-New England coast is criticized. An article from Friends of the Earth is included which makes a five-point proposal that should be undertaken before any development is permitted: (1) elimination of the oil import quota system and the tax incentives so as to force oil companies to freely compete; (2) development of a rational energy policy and program of research for discovery of new energy sources; (3) proof that the proposed oil drilling will not be counter to the public interest; (4) imposition on oil companies of liability for cleanup and damages from oil spills; and (5) improvement of clean-up and tanker technology. The importance of making a realistic assessment of the severity of the energy crisis and the need for removing oil import quotas are stressed. The serious threat to the marine ecology which an oil spill off New England poses is discussed. (Grant-Florida)
W72-13209

LET STATES KEEP NO-DISCHARGE REGULATIONS FOR BOATS,
House, Washington, D.C.
D. M. Fraser.
Congressional Record, Vol. 118, p E5803 (daily ed.) May 25, 1972.

Descriptors: *Boating regulations, *Federal Water Pollution Control Act, *Federal-state water rights conflicts, *Water pollution sources, Boats, Boating, Minnesota, Wisconsin, Federal jurisdiction, State jurisdiction, Legislation, Water pollution, Treatment facilities, Waste storage, Waste treatment, Waste disposal, Sewage treatment, Public health.
Identifiers: *Marine toilets, *Holding tanks.

The joint House-Senate Conference Committee on the Water Pollution Control Act Amendments of

1972 is urged to include and retain an amendment permitting states to regulate and prohibit the discharge of sewage from vessels into their rivers and lakes. Without this amendment the bill preempts the entire area to the federal government, which through the Environmental Protection Agency has specifically not prohibited such discharges. A resolution from the Minnesota-Wisconsin Boundary Area Commission to the EPA recommending that vessels with marine toilets be required to carry holding tanks is included. The resolution considers that the proposed EPA regulations are unsound since they do not require holding tanks and only require that marine toilets installed after 1973 be capable of providing secondary treatment. The Commission contends that: The required tanks would be consistent with federal regulations, no device currently on the market will perform secondary sewage treatment, the proposed EPA regulation will allow continued pollution, and serious doubts exist that recreational vessel treatment plants will be properly maintained. (Grant-Florida)
W72-13210

BOATING--WATER SANITATION.

Federal Register, Vol. 37, No. 132, p 13480, 1972.

Descriptors: *Boating, *Water quality control, *Waste disposal, *National parks, *Great Lakes, Drainage practices, Water resources development, Water law, Federal government, Federal jurisdiction, Freshwater, Low water mark, Regulation, Water management (Applied), Water pollution control, Parks.

Notice is given herein of a proposal to amend section 3.17 of Title 36 of the Code of Federal Regulations. The purpose of these amendments is to prohibit the dumping or discharge from vessels of waste and refuse within park boundaries, where such park boundaries extend into Great Lakes water areas beyond 1 mile from shore. Additional controls have become necessary to combat water pollution and maintain water quality in areas of the National Park System which include Great Lakes water areas. The notice gives the specific changes made and the address to which interested persons may submit comments, suggestions, or objections. It is proposed that paragraphs (a) and (b) of Section 3.17 be amended to read as follows: (a) in fresh waters, the draining, dumping, or discharging of waste or refuse, including human waste, from any vessel into the waters within the boundaries of any federal area administered by the National Park Service is prohibited; (b) in salt water, the draining, dumping, or discharging of waste or refuse, including human waste, from any vessel, into the waters within the boundaries of any federal area administered by the National Park Service is prohibited within 1 nautical mile from the mean low waterline of the nearest shore. (Widman-Florida)
W72-13212

POTOMAC RIVER-WASHINGTON METROPOLITAN REGION ENFORCEMENT CONFERENCE.

For primary bibliographic entry see Field 05G.
W72-13213

GRACI V. UNITED STATES (GOVERNMENTAL IMMUNITY FROM SUIT FOR FLOODWATER DAMAGE).

456 F.2d 20-28 (5th Cir. 1971).

Descriptors: *Louisiana, *Mississippi River, *Flood damage, *Judicial decisions, *Damages, Legislation, Legal aspects, Navigation, Projects, Federal project policy, Negligence, Federal jurisdiction, Hurricanes, Storms.
Identifiers: *Governmental immunity, *Federal Toet Claims Act, *Flood Control Act.

Plaintiffs, landowners in Orleans and St. Bernard Parishes, Louisiana, sued the United States under the Tort Claims Act for floodwater damage. Plaintiffs contended that due to defendant's negligence in constructing the Mississippi River-Gulf Outlet, hurricane-driven waters from Hurricane Betsy overflowed the outlet onto their lands. Defendant contended that it was immune from suit for floodwater damages by virtue of Section 3 of the Flood Control Act of 1928. The United States Court of Appeals, Fifth Circuit held that from a reading of the history and case law construction of the Flood Control Act it was clear that Section 3 prohibits suit only in relation to flood control programs authorized by Congress and not to flood damage arising out of acts unrelated to such programs. The court ruled that the Gulf Outlet was not a flood control project, but a navigation project and therefore Section 3 did not confer immunity from suit for flood damage proximately caused by defendant's negligence in project construction. The court also held that the Tort Claims Act overruled any cases which recognized wholesale governmental immunity for any flood damage. (Grant-Florida)
W72-13215

UNITED STATES V. CROW, POPE AND LAND ENTERPRISES, INC. (DEFINITION OF NAVIGABILITY UNDER THE REFUSE ACT).

340 F.Supp. 25-37 (N.D. Ga. 1972).

Descriptors: *Georgia, *Rivers and Harbors Act, *Navigable rivers, *Legal aspects, Water pollution, Riparian land, Non-navigable waters, Constitutional law, Federal jurisdiction, Feasibility, Economic feasibility, Project feasibility, Discharge (Water), Rivers, Judicial decisions, Legal aspects.
Identifiers: *Corps of Engineers, *Refuse Act.

Plaintiff United States brought suit against defendant real estate developer and apartment complex owner to enforce the Refuse Act. Defendant owned riparian land on the west bank of the Chattahoochee River, near Atlanta. Defendant contended that the portion of the river in question was nonnavigable and therefore the Refuse Act was inapplicable. The United States District Court for the Northern District of Georgia held that in order to be navigable and within the federal jurisdiction a water body must be presently used as or suitable for use as a navigable waterbody, have been used as or been suitable for such use in the past, or suitable for such use in the future by reasonable improvement. The court also held that the portion of the river in question was nonnavigable and that there was no evidence that defendant's discharge would be washed down to a navigable part of the river. The court ruled that use of the river by light pleasure craft was insufficient evidence of present navigability, that past use by three ferries was insufficient to prove past navigability, and that a Corps of Engineers feasibility study in 1879 was not relevant in 1972. (Grant-Florida)
W72-13218

ENVIRONMENTAL PROTECTION AGENCY--GENERAL GRANT REGULATIONS AND PROCEDURES; STATE AND LOCAL ASSISTANCE.

Federal Register, Vol 37, No 112, p 11650-11663, June 1972.

Descriptors: *Water pollution control, *Planning, *Grants, *Regulations, Administrative agencies, Adoption of practices, Administration, Administrative decisions, Standards, Institutions, Institutional constraints, Federal government, Air pollution, Governmental interrelations, Legal aspects, Waste water treatment, Water quality control.
Identifiers: *National Environmental Policy Act, *Environmental Protection Agency.

Interim regulations are promulgated to amend the Environmental Protection Agency's general grant regulations and to publish a new codification of state and local assistance grant regulations supplementing the general grant regulations. The purpose of the regulations is to better coordinate policies and procedures and to better inform prospective grantees. The revisions of EPA general grant regulations constitute purely technical clarifications and not substantive changes. The new part relative to supplemental grants is an attempt to better coordinate EPA policy and procedure. The grant regulations deal with water pollution control planning requirements, water quality management planning grants, solid waste planning grants, air pollution control program grants, water pollution control state and interstate program grants, and grants for construction of wastewater treatment works. The procedures cover eligibility, application requirements, grant limitations, award criteria, required reports, continuation grants, grant amounts, and other administrative requirements. (Grant-Florida)
W72-13219

MARINE SANITATION DEVICE STANDARD.

Federal Register, Vol 37, No 122, p 12391-12393, June 1972.

Descriptors: *Water pollution sources, *Regulation, *Sewage effluents, *Sanitary engineering, *Standards, Boating regulations, Ships, Marine bacteria, Adoption of practices, Administrative agencies, Technology, Microorganisms, Coliforms, Sewage bacteria, Environmental effects, Disposal.
Identifiers: *Marine sanitation devices, Environmental Protection Agency.

Marine sanitation device discharge regulations have been rewritten to conform to the state of existing technology. The regulation applies only to vessels operating in navigable waters of the United States which are equipped with marine toilets. Such vessel toilets must be designed so as to completely prevent any discharge of treated or untreated sewage into navigable waters. The prohibition becomes effective for new vessels two years after promulgation of the regulations and for old vessels five years after such regulations. The regulation is designed to coincide with widespread construction of dockside pumpout treatment facilities. As an interim measure a marine sanitation device which is capable of reducing fecal coliform bacteria to 1,000 per 100 mililiters and which prevents the discharge of an effluent with visible floating solids is acceptable. If such device is installed three years after promulgation of regulations the interim permission lasts for the life of the device. Those installed after three years from promulgation but before discharge is prohibited may be used for three years after the discharge prohibition becomes effective. Provisions are made for states to apply for regulations completely prohibiting sewage discharge into their waters. (Grant-Florida)
W72-13220

AN ACT...IN RELATION TO PROHIBITING INSURANCE COVERAGE AGAINST ENVIRONMENTAL POLLUTION.

New York Laws ch. 765 (1971).

Descriptors: *New York, *Legislation, *Damages, *Insurance, *Compensation, *Protection, Pollution, Legal aspects, Negligence, penalties (Legal), Regulation, Contracts, Discharge, Disposal, Air pollution, Water pollution, Environmental effects, Bodies of water.

The Act is amended to prohibit insurance carriers from insuring commercial and industrial enterprises against environmental pollution they cause. Section 1 prohibits insurance against liability for

personal injury, wrongful death, or economic loss from the negligent rendering of professional services causing pollution or contamination caused by discharge, disposal, release or escape onto land, water or the atmosphere unless it is sudden or accidental. Section 2 prohibits insurance against property damage liability incurred by the insured arising from such pollution or contamination as is specified in section 1. (Grant-Florida)
W72-13221

AN ACT...IN RELATION TO REMOVAL OF ILLEGAL FILL IN PROTECTED WATERS.
New York Laws ch. 713 (1971).

Descriptors: *New York, *Land fills, *Excavation, *Administrative agencies, *Taxes, *Penalties (Legal), Law enforcement, Legislation, Public health, Environmental effects, Bodies of water, Public rights, Penalties, Legal aspects, Adoption of practices, Environment.

The Act confers authority on the Commissioner of public safety to investigate any and all fills or excavations in or on waters of the state which in his judgment are illegal. The Commissioner may investigate the effect such fills or excavations may have on the health, safety, and welfare of the people and their effect on the natural and other environmental resources of the state. After notice and hearing the Commissioner may order any person or local public corporation who henceforth makes an illegal or unsafe fill or excavation to remove, replace, or correct the excavated materials or fill. The Commissioner may enforce his orders upon the respondent's failing omitting, or neglecting to comply by seeking a fine in court. The Commissioner may additionally, upon violation of any such order, enter lands or water where the condition exists and take such actions as are necessary to safeguard life, property, and the environment. Any costs incurred by the state for taking such necessary action may be taxed to the real property upon which the excavation or fill was made and shall become a tax lien against the property. (Grant-Florida)
W72-13222

WATER--RIVERS AND STREAMS--MINIMUM FLOW.
Conn. Public Act No 229 (1971).

Descriptors: *Connecticut, *Legislation, *Flow rates, *Regulation, *State governments, Flow control, Legal aspects, Water management (Applied), Standards, Stocking, Penalties (Legal), Law enforcement, Public rights, River regulation, Administrative agencies, Adoption of practices.

The water resources commission shall, after due consultation, consideration, and notice, hold a public hearing and, not earlier than thirty days thereafter, shall promulgate regulations establishing instantaneous minimum flow standards and regulations for all stocked river and stream systems. These shall: (1) apply to all river and stream systems for which it is reasonably necessary to keep a sufficient flow of water to protect and safely maintain the fish placed therein, (2) preserve and protect the natural aquatic life contained within such waters, (3) preserve and protect the natural and stocked wildlife dependent upon the flow of such water, (4) promote and protect the usage of such water for public recreation, and (5) be consistent with the public need and lawful uses of such waters. The commission shall issue an order, which shall include a time schedule to be followed, to any violators of this act to comply with its regulations. If such person does not comply the commission is empowered to seek injunctive relief to stop such person, firm or corporation from restricting the flow of such water. (Widman-Florida)
W72-13223

SALT WATER IS A MINERAL: OWNERSHIP OF A NATURAL RESOURCE OF INCREASING IMPORTANCE IN OIL PRODUCING STATES,
For primary bibliographic entry see Field 03E.
W72-13225

ON BUYING CLEAN WATER--REFLECTIONS ON THE GEORGIA WATER POLLUTION CONTROLS,
For primary bibliographic entry see Field 05G.
W72-13226

GEORGIA'S ENVIRONMENTAL LAW: A SURVEY,
For primary bibliographic entry see Field 05G.
W72-13227

WATER POLLUTION CONTROL LEGISLATION--1971 (H.R. 11896, H.R. 11895).
For primary bibliographic entry see Field 05G.
W72-13228

A CITIZEN'S ACTION HANDBOOK: THE REFUSE ACT PERMIT PROGRAM,
Natural Resources Defense Council, New York.
For primary bibliographic entry see Field 05G.
W72-13229

ON MARYLAND'S ENVIRONMENTAL SERVICE,
E. E. Halmos.
Water and Sewage Works, Vol 119, No 4, p 54-59, April 1972. 7 fig.

Descriptors: *Management, *Legislation, *Financing, *Personnel, Water supply, Sewage, *Maryland state governments, Administrative agencies, Local governments.
Identifiers: *Environmental service.

Through its 1 1/2 year old Maryland Environmental Service (MES) the State is offering help to its counties and municipalities in matters such as local financing, availability of trained operators, and possible cost reductions through scale of projects. Upon request, the MES can perform several tasks. (1) Undertake design, construction and operation of either large scale regional systems or local systems, (2) 'Buy out' a local treatment plant and operate it-or operate a whole system - for an agreed-upon fee based on retirement of bonds and operating costs (collector systems and decisions on extensions remain with the local government). (3) Assist in financing, by arranging temporary loans, then combining several such into a major bond issue for long-term retirement, with each participating government picking up payments of interest and principal on its share of the total. For such service, MES has set an annual service charge of $250. Obtaining trained, qualified personnel has been a serious problem for many communities, most of which cannot individually pay salaries commensurate with responsibilities. MES can provide such personnel by (1) buying and operating, or (b) agreeing to a contract to operate the system, while ownership remains local. The Governor has designated MES as the official river basin planning agency. The regional approach seems best in a state whose terrain varies from tidal lowlands in the East to mountainous western sectors. One of the MES biggest tasks is to educate local governmental leaders as to what the organization can do. There is no plan to build a large organization. (Bean-AWWARF)
W72-13256

GUIDELINES FOR DISCHARGE WATERS ARE BEING STUDIED.
For primary bibliographic entry see Field 05G.
W72-13328

FEDERAL ASSISTANCE IN ACHIEVING WATER UTILITY GOALS, JOINT DISCUSSION,
Department of Housing and Urban Development, Washington, D.C. Community Resources Development Administration.
R. M. Paul.
Journal of the American Water Works Association, Vol. 63, No. 4, p 206-209, April 1971. 2 photo.

Descriptors: *Federal government, *Government finance, *Utilities, *Planning, Environment, Long-term planning, Economics.
Identifiers: *Federal assistance, *Water utility goals, Revenue-sharing.

Very few water utilities have well-defined long-range plans concerning such questions as where water lines will be built, how much the water will cost, when water will be supplied, and where future supplies will be found. Until answers are provided, serious doubt will exist about whether accurate forecasts of future federal assistance are possible. Although many federal agencies dealing with water utility matters have not defined their objectives, this is not the case with the Department of Housing and Urban Development (HUD). The objectives of HUD are: (1) to provide decent housing for all Americans, (2) to provide a suitable living environment for every American, and (3) to improve the management of community development. An overview for water planning is needed. Too often, urban-development projects have ignored the opportunities and constraints of the physical environment. The primary environmental consequences of a project have not been considered important. Federal assistance for water utilities will depend on providing adequate consideration of the social environment. There is a need for communication directly with the people to be served in order to understand their particular problems. This 'new look' in water-utility planning and construction will be paralleled by new approaches at the federal level. Emphasis will be on revenue-sharing to filter money back to state and local governments. The water utilities must clearly demonstrate their commitment ot help meet national environmental goals. (See also W72-13556 and W72-13557) (Strachan-Chicago)
W72-13555

FEDERAL ASSISTANCE IN ACHIEVING WATER UTILITY GOALS, JOINT DISCUSSION,
Farmers Home Administration, Washington, D.C. Community Services Div.
D. E. Sprague.
Journal of the American Water Works Association, Vol. 63, No. 4, p 209-210, April 1971.

Descriptors: *Federal government, *Government finance, *Utilities, *Planning, Waste disposal, Resources development, Economics, Loans, Grants.
Identifiers: *Federal assistance, *Water utility goals, Funding.

The Farmers Home Administration (FHA) has helped rural communities with the development of water facilities since 1937. Public Law 89-240 (1965) amended the Agricultural Act of 1961, to provide authority for the FHA to extend financial assistance, including both loans and grants up to a maximum of $4,000,000 to rural communities for the development or improvement of domestic water and waste disposal facilities. Public or quasi-public agencies and private nonprofit corporations may recieve financial and technical assistance in planning, developing, and improving facilities for extending water and waste-disposal service, provided they are unable to obtain adequate credit from other sources. Funds may be used to install and improve: (1) works for the development, treatment, purification, and distribution of water, and (2) facilities for the collection, treatment, and disposal of human, animal, and other wastes. The

Economic Research Service of the Department of Agriculture has determined that there are over 34,000 rural towns without adequate water systems and 44,000 communities without adequate central sewer systems. The needs for water and waste disposal plus assistance in their development are great. It is obvious that the FHA will be unable to handle all requests for financial assistance. Other federal agencies, such as the Economic Development Administration, the Federal Water Pollution Control Administration, and the Department of Housing and Urban Development have been authorized to assist communities with the development of water and waste disposal facilities. Cooperation between interests and these agencies is the best approach to water problems. (See also W72-13555 and W72-13557) (Strachan-Chicago)
W72-13556

FEDERAL ASSISTANCE IN ACHIEVING WATER UTILITY GOALS, JOINT DISCUSSION,
Economic Development Administration, Washington, D.C.
H. S. Brooks.
Journal of the American Water Works Association, Vol. 63, No. 4, p 210-212, April 1971.

Descriptors: *Federal government, *Government finance, *Utilities, *Planning, Economics, Resources development, Coordination, Grants, Loans, Training.
Identifiers: *Federal assistance, *Water utility goals, Economic-development oriented, Technical assistance.

The Economic Development Administration (EDA) in the Department of Commerce was created in 1965 to provide federal financial assistance to economically distressed areas of the US in order to enable those areas to plan and finance effective development. The basic objectives of the program are to cut down on joblessness in depressed areas, to bring employment more in line with the rest of the country, and to restore vitality and growth to those areas. EDA is economic-development oriented. It encourages overall area planning. Grants and loans for public works and development projects, business loans, technical assistance, and retraining of workers are the implements of the Administration. The jobless worker and the depressed area are impediments to a vibrant economy. In helping to alleviate these conditions, the EDA program is promoting the well-being and prosperity of the entire country. The policy of EDA is that projects must be originated by local interest. EDA participation must be requested by a responsible area organization, and the initiating body must be willing to commit local funding. Projects accepted by EDA for consideration are coordinated with interested local and state agencies, plus other elements of the federal government. (See also W72-13555 and W72-13556) (Strachan-Chicago)
W72-13557

PRICING POLLUTION AND OTHER NEGATIVE EXTERNALITIES,
Ohio State Univ., Columbus. Dept. of Economics.
For primary bibliographic entry see Field 05G.
W72-13559

BENEFITS OR COSTS. AN ASSESSMENT OF THE WATER RESOURCES COUNCIL'S PROPOSED PRINCIPLES AND STANDARDS,
Resources for the Future, Inc., Washington, D.C.; George Washington Univ., Washington, D.C.; Johns Hopkins Univ., Baltimore, Md.; Wisconsin Univ., Madison; and Harvard Univ., Cambridge, Mass. Harvard Development Advisory Service.
For primary bibliographic entry see Field 06B.
W72-13562

PUBLIC WATER RESOURCE PROJECT PLANNING AND EVALUATION: IMPACTS, INCIDENCE, AND INSTITUTIONS,
Wisconsin Univ., Madison. Dept. of Agricultural Economics; and Michigan State Univ., East Lansing. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 06B.
W72-13565

6G. Ecologic Impact of Water Development

TOWARD AN ECONOMICS OF ECOLOGY,
H. Henderson.
Columbia Journal of World Business, p 31-40, May-June, 1972. 15 ref.

Descriptors: *Ecology, *Economics, *Environmental effects, *Social impact, Equilibrium, Cost-benefit analysis, Profit.
Identifiers: *Economic incentives, Economic growth, Steady state equilibrium.

Narrowly defined economic values have recently been seriously questioned by ecologists and environmental protectionists. This growing consciousness that policies of maximum growth, by private or state-directed means, often produce unacceptable and unanticipated social and environmental costs has led to deeper questioning of such economic concepts as profit and gross national product. By focusing on concepts as profit, an economy maximizes its pollution-creating activities. Consequently, new analytical tools need to be developed. Such tools should be aimed at an accurate assessment of the social and environmental diseconomies of private and public economic policies. Only with improved measurement tools can the impact of such projects as the Royal Dutch/Shell's proposed supertanker port in Wales be fully evaluated. Once we begin to account for diseconomies, we should enjoy benefits in the form of (1) better energy-conversion ratios, (2) better resource management and rehabilitation, and (3) better market research into those areas where individual consumer choice is inoperative until it is 'aggregated'. Furthermore, we will better recognize the need to approach a steady-state equilibrium which will make realistic demands on our natural resource reserves. (Settle-Wisconsin)
W72-13087

DIMENSIONS OF THE ENVIRONMENTAL CRISIS,
J. A. Day, F. F. Fost, and P. Rose.
John Wiley and Sons, Inc.: New York, N. Y., London, England. 1971. 212 p. Illus. Pr. $5.95.
Identifiers: Conservation, Dimensions, Ecosystems, *Environment, Human population, Pollution, *Interdisciplinary approach.

The purpose is to emphasize the many interrelated dimensions of the environmental crisis and to demonstrate that a permanent solution can come only through an interdisciplinary approach in which knowledge of the humanities is integrated with that of science and technology. An attempt is made to explore the basic nature of environmental problems and their solutions. Section 1, cultural background includes the following papers: The Cultural Basis for Our Environmental Crisis, by L. W. Moncrief; The Population Explosion and the Rights of the Subhuman World, by J. B. Cobb, Jr.; Our Treatment of Environment in Ideal and Actuality, by Yi-Fu Tuan. Section 2, the global aspect, includes Montgaging the Old Homstead, by Lord Ritchie-Calder, and The Convergence of Environmental Disruption, by M. I. Goldman. Population and the Dignity of Man, by R. L. Shinn, and The Energy Revolution: Peril and Promise, by G. Taylor are found in Section 3. Section 4, basic appraoches to the solution, includes the following papers: Ecosystem Science as a Point of Synthesis, by S. D. Ripley and H. K. Buechner; How Should the University Treat Environment, by F. K. Hare; From Conservation to Environmental Law, by D. Sive; Pollution Problems, Resource Policy, and the Scientist, by A. W. Eipper; and The Experimental City, by A. Spilhaus. Reference sources for each section are included.--Copyright 1972, Biological Abstracts, Inc.
W72-13145

THE CHESAPEAKE BAY, REPORT OF A RESEARCH PLANNING STUDY,
Johns Hopkins Univ., Baltimore, Md.; Maryland Univ., College Park; and Virginia Inst. of Marine Science, Gloucester Point.
R. F. Beers, B. Filmore, L. M. Brush, Jr., R. J. Byrne, and L. E. Cronin.
Available from the National Technical Information Service as PB-201 189, $3.00 in paper copy, $0.95 in microfiche. March 1971. 219 p, 7 fig, 7 tab. NSF G I-47.

Descriptors: *Chesapeake Bay, *Environmental control, *Planning, *Regional analysis, *Decision making, *Environmental effects, Management, Water conservation, Census, Administration, Project post-evaluation, Bays, Water quality, Systems analysis, Input-output analysis, Computer models, Estuaries, Forecasting, Project planning, Oceanography.
Identifiers: *Impact studies, Interdisciplinary studies, Research management, Research needs.

An interdisciplinary study team of personnel from universities and other organizations conducted studies of the environment in Chesapeake Bay. There were three objectives: (1) to design a program to enable various institutions within the Chesapeake Bay region to contribute more effectively to better management and control of this complex environmental system; (2) to define and coordinate the research which must be done to best contribute to the decision-making process; and (3) to propose an organization for coordinating and directing the program. To achieve these first objectives, an inventory was made of entities, processes and characteristics of the region. Ways were suggested for extending and utilizing the inventory. Systems models and information procedures were explored and research was proposed to contribute to better management of the environment. A Chesapeake Research Consortium is proposed. It would be under the direction of a full-time executive who would be answerable to a Board of Directors comprised of representatives from The Johns Hopkins University, The University of Maryland and the Viriginia Institute of Marine Science. Case studies of existing and proposed facilities surrounding Chesapeake Bay are suggested as a means of contributing to the inventory data bank and to prosecution of long-range goals directed to input-output analysis. (Poertner)
W72-13165

MISSISSIPPI RIVER, EAST BANK, WARREN TO WILKINSON COUNTIES, MISSISSIPPI (NATCHEZ AREA) (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Vicksburg, Miss.
For primary bibliographic entry see Field 08A.
W72-13217

PROPOSED BIG CYPRESS NATIONAL FRESH WATER RESERVE, FLORIDA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
National Park Service, Richmond, Va. Southeast Region.

Available from the National Technical Information Service as PB-206 380D, $3.00 in paper copy, $0.95 in microfiche. February 5, 1972. 84 p, 3 map, 1 tab, 10 ref, 2 append.

Descriptors: *Wetlands, *National parks, *Florida, *Environmental effects, Multiple-purpose projects, Conservation, Federal reservations, Public lands, Adoption of practices, Social aspects, Water quality control, Water management (Applied), Comprehensive planning, Project planning, Estuaries, Aquatic habitats, Swamps.
Identifiers: *Environmental Impact Statements, *Big Cypress Swamp (Fla.).

The proposed project involves acquisition of 585,000 acres in Big Cypress Watershed in Collier, Monroe, and Dade Counties, Florida, by the federal government. These areas are critical to the protection of freshwater resources of the Everglades National Park, estuarine regions, and cities of southwest Florida. The acquisition period would cover 10 years. The ecosystem of Big Cypress is described in detail. The project will have a favorable impact on the environment by controlling drainage and maintaining high water quality, quantity, and flow to park estuaries and preserving future water supplies for southwest Florida. Indian cultures in the area can continue in traditional surroundings. Unfavorable impacts are all economic, including loss in taxes and development opportunities. Alternatives considered include taking no action to protect Big Cypress and the following alternative methods of protection: land use planning and zoning, joint local-federal control, control by trusteeship, federal land use restrictions, and control by a public corporation. Appendices contain lists of flowering plants and animals considered significant to the ecosystem. (Widman-Florida)
W72-13224

ON BUYING CLEAN WATER--REFLECTIONS ON THE GEORGIA WATER POLLUTION CONTROLS,
For primary bibliographic entry see Field 05G.
W72-13226

GEORGIA'S ENVIRONMENTAL LAW: A SURVEY,
For primary bibliographic entry see Field 05G.
W72-13227

THE CRISIS IN POWER-PLANT SITING,
Oak Ridge National Lab. Tenn.
For primary bibliographic entry see Field 05B.
W72-13321

ENERGY-ENVIRONMENT DILEMMA: SOLUTIONS SOUGHT.
For primary bibliographic entry see Field 05G.
W72-13323

CONSERVATIONISTS WIN LAKE COOLING TOWER BATTLE.
For primary bibliographic entry see Field 05G.
W72-13326

MANAGING THE POWER SUPPLY AND THE ENVIRONMENT.

Report of the Federal Power Commission's National Power Survey Task Force on Environment, Washington, D.C., July 1, 1971. 41 p.

Descriptors: *Electric power, *Environmental effects, *Electric power industry, *Nuclear powerplants, Costs, Regulation, Air pollution, Aesthetics, Water pollution, *Thermal pollution, Sites, Radioactivity effects.

The Task Force urges that the electric utilities should take the responsibility for resolving environmental problems. Regulatory agencies should face squarely the fact that the cost of environmental safeguards is a part of the cost of producing electricity. The future demand for power is discussed, considering forces which accelerate electrical power usage and possibilities for slowing it down. The electric industry's growth produces environmental effects in the areas of air, water and land use, thermal and radiological pollution and aesthetics. Problems in these areas, effects of regulations on costs and competitive energy sources and some possible solutions are mentioned. Research and development are needed to make the process of power supply more efficient so that environmental consequences will be less. The costs of lessening environmental problems are predicted with a recommendation for better cooperation among the industry, the regulatory authorities and the public. The task force listed problems with power production which nuclear power can solve and stated that with effort, nuclear power should provide electricity at the least cost and with little environmental impact. (Eagle-Vanderbilt)
W72-13332

THE WATER USE AND MANAGEMENT ASPECTS OF STEAM ELECTRIC POWER GENERATION.
National Water Commission, Arlington, Va. Consulting Panel on Waste Heat.
For primary bibliographic entry see Field 05B.
W72-13355

THERMAL POLLUTION IN UNCHARTED WATERS.
For primary bibliographic entry see Field 05C.
W72-13452

WORLD AND WATER IMPERATIVES: WORLD CITY OF THE FUTURE,
Doxiadis Associates, Athens (Greece).
For primary bibliographic entry see Field 05G.
W72-13549

INSTANCES, IF ANY, WHERE COST/BENEFIT ANALYSIS HAS BEEN APPLIED TO ENVIRONMENTAL PROBLEMS, UNITED STATES.
National Air Pollution Control Administration, Washington, D.C.
For primary bibliographic entry see Field 06B.
W72-13563

07. RESOURCES DATA

7B. Data Acquisition

DETECTION OF ABANDONED UNDERGROUND COAL MINES BY GEOPHYSICAL METHODS.
HRB-Singer, Inc., State College, Pa. Environmental Sciences Branch.
For primary bibliographic entry see Field 05B.
W72-13045

AN INTEGRATED STUDY OF EARTH RESOURCES IN THE STATE OF CALIFORNIA USING REMOTE SENSING TECHNIQUES,
California Univ., Berkeley; California Univ., Irvine; California Univ., Davis; California Univ., Los Angeles; California Univ., Riverside; and California Univ., Santa Barbara.
R. N. Colwell, C. W. Churchman, R. H. Burgy, G. A. Thorley, and G. Schubert.
Available from NTIS, Springfield, Va 22151 as N71-32896, Price $3.00 paper copy, $0.95 microfiche. California University Space Science Laboratory Report, May 1, 1971. 255 p. NASA Grant NGL 05-003-404.

Descriptors: *Remote sensing, *Water resources development, *California, Aircraft, Satellites (Artificial), Data collections, Data processing, Environmental effects, Water pollution sources, Pollutant identification.
Identifiers: California Water Project.

This progress report describes (1) the integrated approach in the study of earth resources in the State of California by means of remote sensing and (2) the concentrated effort on one of the most significant components of California's earth resources, the California Water Project. Some of the complex socio-economic factors involved in the California Water Project are reviewed, considering the potential users of water resources and the potential managers of water resources. The parameters that govern the yield of water, especially in the source or headwaters area of the California Water Project, the surface and subsurface flow of water, and the consumption of water are defined. The largest section deals with efforts to determine the extent to which remote sensing can be used to measure hydrologic parameters in the source, central, and sink areas of the California Water Project. Remote sensing studies are proposed for the Coastal and River Delta resources. Approximately 75% of California's population lives in the Coastal zone. Such problems as monitoring compliance to laws governing sewage disposal and industrial development and the resultant change in land use and environment, provide additional uses of remote sensing technology. (Knapp-USGS)
W72-13052

AN ANNOTATED BIBLIOGRAPHY OF REMOTE SENSING OF AIR AND WATER POLLUTION,
Iowa Univ., Iowa City.
For primary bibliographic entry see Field 05A.
W72-13055

AN AUTOMATIC DIGITAL WATER LEVEL FOLLOWER,
Centre National de la Recherche Scientifique, Toulouse (France). Hydraulic Lab.; and Toulouse Univ. (France) Institut de Mecanique des Fluides.
J. Piquemal.
Journal of Hydraulics Research, Vol 9, No 4, p 555-563, 1971. 8 fig, 1 ref, append.

Descriptors: *Water levels, *Water level fluctuations, *Instrumentation, Measurement, Accuracy, Data processing, Digital systems, Automatic control, Manual control, Remote sensing, Automation, Gages.
Identifiers: *Water-level recorders, France, Cost savings.

A new system for remote reading of a digital water level gage, which automatically follows very slow water level variations, provides a simple, economical means of continuous water level measurement. The measuring system is simple in design, inexpensive, and accurate within a few tenths of a mm when operating automatically. This remote-reading water level measuring device is easily adapted to automatic data processing applications. The principle of the water level follower and the practical features of the system are discussed. The system may be operated manually by switching from the automatic position to manual. When manually operated, the water level accuracy is plus or minus 0.1 mm. (USBR)
W72-13118

THE VERTICAL SLOT AS A FLOW MEASUREMENT DEVICE,
Waterloo Univ. (Ontario); and Ontario Water Resources Commission, Toronto.
H. M. Hill, F. C. Ford, and T. E. Unny.
Engineering Journal, Canada, Vol 55, No 1-2, p I-V, Jan-Feb 1972. 10 fig, 4 ref, 2 append.

Descriptors: *Flow measurement, *Open channel flow, *Water measurement, Hydraulic structures, Analysis, Limiting factors, Measurement, Viscosity, Discharge coefficient, Velocity, Discharge (Water).
Identifiers: Canada, Slots, Critical depth, Test results.

A simply constructed, low cost open channel flow measurement device with minimal submergence permits passing debris without changing flow conditions within the measurement structure. The flow constriction which causes critical depth to occur, is accomplished by 2 walls of equal length protruding from channel walls. Because this flow measurement structure causes critical depth, provided the submergence ratio is not less than a limiting value, the flow is a unique function of the upstream depth, allowing the designer to take only one measurement. Wingwalls may be used with the slot to prevent silting when the water carries debris. The vertical slot is simple to build, inexpensive, and may be built of either steel plate or concrete, depending on the size of the channel and application. The discharge coefficient is determined for the normal operating regime of the measuring device. The limitations caused by viscosity, drowning, and constricting wall thickness are defined. (USBR)
W72-13129

VISIBLE AND NEAR INFRARED REMOTE--SENSING OF SOIL MOISTURE LEVELS,
Tennessee Univ., Knoxville.
J. I. Sewell, W. H. Allen, and R. S. Pile.
Transactions American Society of Agricultural Engineers, Vol 14, No 6, p 1163-1166, Nov-Dec. 1971. 5 fig, 4 tab, 9 ref.

Descriptors: *Remote sensing, *Aerial photography, Soil moisture, Water content, Photography, Drainage, Irrigation, Laboratory tests, On-site tests, Films, Cameras, Loam, Thermal radiation, Soil surfaces, Soils, Moisture, Moisture content filters.
Identifiers: Infrared imagery, Infrared photography, Photography, Optical instruments, Photo interpretation, Infrared detectors.

Laboratory and field tests using infrared photographic techniques show that detecting differences in surface soil moisture levels of fallow soils is technically possible. A technique for evaluating the soil moisture levels of large areas will be useful in locating areas needing improved drainage and for scheduling irrigation. Differences between film density and surface moisture were detected best with color infrared film and Wratten No 15 or No 15 plus 80B film filters. While black-and-white infrared film can also be used to detect surface soil moisture differences, color infrared film exhibited greater variations in the tone associated with soil moisture differences. Variations in optical density of infrared photographs are more closely related to color and reflected light than to thermal properties. The precision of aerial infrared photographic studies may be adversely affected by varying cloud cover, different sun angles, differences between film lots, and differences between runs in film processing. Evaluating soil moisture levels of soils having heavy vegetal cover may be difficult. (USBR)
W72-13130

A MICROSPLITTER FOR SUBSAMPLING SMALL PARTICULATE SAMPLES,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Soils.
For primary bibliographic entry see Field 02J.
W72-13183

A NEW FILTERING WATER BOTTLE,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
For primary bibliographic entry see Field 02J.
W72-13184

A QUANTITATIVE X-RAY DIFFRACTION TECHNIQUE APPLIED TO FINE-GRAINED SEDIMENTS OF THE DEEP GULF OF MEXICO,
LeNickel (Australia) Exploration Party Ltd., Perth.
For primary bibliographic entry see Field 02J.
W72-13186

A NOTE ON THE MEASUREMENT OF PLANAR VELOCITY FIELDS BY STEREO--PHOTOGRAMMETRY,
Southampton Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 02E.
W72-13200

IMMEDIATE AND REMOTE DATA PROCESSING SYSTEM FOR LAKE CHAMPLAIN,
Vermont Univ., Burlington. Lake Champlain Studies Center.
E. B. Henson.
Available from the National Technical Information Service as PB-211 606, $3.00 in paper copy, $0.95 in microfiche. Vermont University Lake Champlain Studies Center, Completion Report, March 1972. 19 p, 5 fig. OWRR B-003-Vt (1).

Descriptors: *Remote sensing, *Data processing, *Lakes, *Data collections, *Telemetry, Radio communication systems, Instrumentation, Water temperature, Winds, Currents (Water), Electronic equipment, Data transmission, *Vermont, New York.
Identifiers: *Lake Champlain (Vermont and New York).

Details are given for communications and data processing system developed to assist and facilitate hydrologic research on Lake Champlain (Vermont and New York). The system functions for Audio Information Transmission (AITS) and for Remote Information Processing (RIPS). Both of these functions utilize broadcasting signals to a repeater unit situated on a television tower on the top of Mt. Mansfield. The repeater then transmits the signal to base control at the University of Vermont on another assigned frequency. The AITS allows voice communication between base control and any of four research vessels on the lake, or between any of the four vessels. The research leader is therefore able to coordinate sampling with as many as four boats on the lake at the same time. The RIPS is able to collect, translate, transmit, and record selected data from a remote position on the lake according to an assigned time schedule. RIPS is housed in a buoy anchored in open Lake Champlain, and is designed to telemeter data to base control 12 times a day, giving information on wind and sea state conditions, water temperature, and water current direction. (Woodard-USGS)
W72-13262

A NEW TECHNIQUE FOR TIME-VARIANT GROUND WATER FLOW ANALYSIS,
For primary bibliographic entry see Field 02F.
W72-13263

'REAL-TIME' THERMAL-PROFILE MONITOR IS GIVEN A CHECKOUT.
For primary bibliographic entry see Field 05B.
W72-13327

A NEW MODEL OF THE KAJAK BOTTOM SAMPLER, AND OOTHER IMPROVEMENTS IN THE ZOOBENTHOS SAMPLING TECHNIQUE,
Helsinki Univ., Lammi (Finland). Lammi Biological Station.
Ilpo Hakala.
Ann Zool Fenn, Vol 8, No 3, p 422-426, 1971, Illus.
Identifiers: Benthos, *Bottom sampling, Improvements, Kajak corer, New, Sampling, Techniques, *On-site data collections.

Two multiple-unit versions of the Kajak type corer are described, one with 6 units and the other with 3 units and an automatic releasing mechanism. Both corers are made of polyvinylchloride and brass. A slicing device for use with the corers was designed to permit study of the vertical distribution of the zoobenthos. Further, a sieving technique especially suited for the study of the zoomeiobenthos is described, in which the sieving residue can be studied with the aid of a movable grooved disc in which the entire width of each groove is visible simultaneously at a magnification suitable for the study of the meiofauna. Detailed diagrams of the construction of these improvements are presented. It is suggested that the relatively large number of animals per unit area obtained with the aid of the technique described is chiefly due to the fact that, as in the original model, the tube corers do not disturb the surface layer of the bottom, where the density of zoobenthos is highest.--Copyright 1972, Biological Abstracts, Inc.
W72-13338

THE IMPORTANCE OF AERIAL PHOTOGRAPHY IN ESTABLISHING MORPHOGENETIC CLASSES OF BOG AREAS AND SYSTEMS,
E. A. Galkina, and V. N. Kiryushkin.
Dokl Komis Aeros'Emki Fotogrammetrii Geogr O-Va SSSR. 6, p 38-49. 1969.
Identifiers: *Aerial photography, *Bogs, Classes.

In the northern European part of the forest zone of the USSR, 10 classes of distinctive bog areas differing in the configuration of the bog depression and in the forms of the primary water currents are distinguished. These areas are in closed basins (on aerial photographs they are distinguished as round or oval forms, in addition to other characteristics), karst cones (same shape, but not more than 50 m in diameter), runoff depressions (fanshaped), etc. A table shows for each class the nature of the depression, shape of the network of flow lines, the course of development of the bog area and adaptation to the morphogenetic type of the relief. The morphogenetic subdivisions of bog systems are simple (consisting of a single type of bog area), complex (consisting of bog areas of a single class, but of different types), or very complex (consisting of bog areas of different classes).--Copyright 1972, Biological Abstracts, Inc.
W72-13369

TECHNIQUE OF SOIL STUDY OF THE ROUTES OF MOVEMENT OF LIQUID MOISTURE IN THE SOIL,
Moscow State Univ. (USSR). Dept. of Soil Physics and Reclamation.
For primary bibliographic entry see Field 02G.
W72-13373

A NEW HYDROMETER,
California Univ., Davis.
K. Arulanandan, and S. S. Smith.
Soil Sci. Vol 112, No 3, p 206-212. 1971. Illus.
Identifiers: *Hydrometers, *Instrumentation, Moisture, Soils.

A new hydrometer is described that offers both the accuracy of the pipette method and the simplicity of the Cassagrande Hydrometer. The hydrometer and the pipette give the same results allowing for slight differences in the preparation of the sample. The hydrometer is a continuous recording device. The necessary calculations are few and the distribution and summation curves can be obtained quickly from the deflection accumulation curve.--Copyright 1972, Biological Abstracts, Inc.
W72-13432

AN EVALUATION OF TWO NEUSTON SAMPLERS,
Bedford Inst., Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
For primary bibliographic entry see Field 05A.
W72-13446

RAIN GAGE CATCH VARIATION DUE TO AIRFLOW DISTURBANCES AROUND A STANDARD RAIN GAGE,
Washington State Univ., Pullman. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 02B.
W72-13463

ULTRASONIC VELOCITIES OF THE DILATATIONAL AND SHEAR WAVES IN FROZEN SOILS,
Cold Regions Research and Engineering Lab., Hanover, N.H. Foundations and Materials Research Branch.
For primary bibliographic entry see Field 02C.
W72-13470

ELECTRONIC MEASURING DEVICES IN AGROPHYSICAL INVESTIGATIONS (IN RUSSIAN).
Agrofizicheskii Nauchno-Issledovatelskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 03F.
W72-13486

7C. Evaluation, Processing and Publication

WATER RESOURCES OF WISCONSIN, CHIPPEWA RIVER BASIN,
Geological Survey, Washington, D.C.
H. L. Young, and S. M. Hindall.
For sale by USGS, Washington, DC 20240, Price $1.75 per set. Geological Survey Hydrologic Investigations Atlas HA-386, 4 sheets, 1972. 26 fig, 5 tab, 40 ref.

Descriptors: *Water resources development, *Surface waters, *Groundwater resources, *Water supply, *Wisconsin, Streamflow, Hydrogeology, Aquifers, Water yield, Water quality, Water utilization, Groundwater recharge, Water level fluctuations, Hydrologic cycle, Hydrologic data, Data collections, Maps, Hydrographs, Sediment transport.
Identifiers: *Chippewa River Basin (Wis).

This 4-sheet hydrologic atlas describes the physical environment and water resources of the Chippewa River Basin in Wisconsin. Igneous and metamorphic rocks of Precambrian age underlie the basin. Average annual precipitation is greatest in the east and northeast (34 inches) and lowest in the west (28 inches). Average runoff, 7,431 cfs, equals 10.7 inches per year on the basin. Water-level records for the wet and dry years generally responded to the extremes in precipitation. The net annual rise or fall of the water table is about 6 inches and 3 inches, respectively. Assuming a storage coefficient of 0.15, these changes in water level equal about 1 and 0.5 inch of water, respectively. High concentration of iron or manganese is the most common groundwater quality problem. About 1,750 billion gallons of surface water leave the basin as streamflow each year. The chemical quality of water in streams and lakes in the Chippewa River Basin is generally very good. The water is characteristically soft, except in the southwestern part of the basin. Average annual sediment yields range from less than 10 to more than 40 tons per square mile. (Woodard-USGS)
W72-13046

GEOLOGY, HYDROLOGY, AND WATER QUALITY OF THE TRACY-DOS PALOS AREA, SAN JOAQUIN VALLEY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 02F.
W72-13051

A WIDE-AREA INVESTIGATION OF WATER UTILIZATION--PRIMARY REPORT.
Ministry of Construction, Tokyo (Japan). River Bureau.
For primary bibliographic entry see Field 06D.
W72-13054

WATER RESOURCES INVESTIGATIONS IN HAWAII AND OTHER PACIFIC AREAS, 1969.
Geological Survey, Washington, D.C.

Geological Survey Report of Investigations Folder, 1 sheet, 1970. 6 fig.

Descriptors: *Water resources, *Investigations, *Inter-agency cooperation, Surveys, Planning, Hydrologic data, Basic data collections, Rainfall, Streamflow, Sediment transport, On-site investigations, Water temperature, Water quality, Water level fluctuations, Bibliographies, Networks, Maps.
Identifiers: *Cooperative water-studies program, Research projects.

Water resources studies and investigations of the U.S. Geological Survey in Hawaii, Guam, American Samoa, the Trust Territory of the Pacific Islands, and Okinawa are summarized. A selected bibliography of material concerning the areas is included. A list is given of State and Federal agencies, counties, and cities who cooperate in different parts of the program. The hydrologic data network consists of 184 primary, secondary, and water management streamflow stations; 40 groundwater observation wells; and 26 surface water and 49 groundwater quality observing sites. Small State maps show principal sources of groundwater and average annual precipitation. A map, scale 10 mi to the inch, shows by symbols, numbers, and colored outline the hydrologic data network and investigations in Hawaii, Guam, and American Samoa in September 1969. Other maps show hydrologic data networks in the Trust Territory of the Pacific Islands and Okinawa as of September 1969. (Woodard-USGS)
W72-13061

OPTIMIZATION MODEL FOR CHURCHILL RIVER DIVERSION,
Metcalf and Eddy, Inc., Boston, Mass.
For primary bibliographic entry see Field 04A.
W72-13134

A MULTIPLE GROUPING METHOD FOR THE CHOICE OF ISOPLETH VALUES OF MINERAL DISTRIBUTION MAPS,
LeNickel (Australia) Exploration Party Ltd., Perth.
For primary bibliographic entry see Field 02J.
W72-13185

MAP PATTERN RECONSTRUCTION FROM SAMPLE DATA: MISSISSIPPI DELTA REGION OF SOUTHEAST LOUISIANA,
Illinois Univ., Chicago. Dept. of Geological Sciences.
For primary bibliographic entry see Field 02J.
W72-13190

IMMEDIATE AND REMOTE DATA PROCESSING SYSTEM FOR LAKE CHAMPLAIN,
Vermont Univ., Burlington. Lake Champlain Studies Center.
For primary bibliographic entry see Field 07B.
W72-13262

RADIOLOGICAL SURVEYS OF PEARL HARBOR, HAWAII, AND ENVIRONS, 1966-1968,
Eastern Environmental Radiation Lab., Montgomery, Ala.
For primary bibliographic entry see Field 05B.
W72-13271

SATELLITE CLIMATOLOGY,
K. Ya. Kondrat'yev.
Available from NTIS, Springfield, Va 22151- NASA TT F-723 Price $3.00 paper copy, $0.95 in microfiche. National Aeronautics and Space Administration Technical Translation Report (NASA TT F-723), June 1972. 77 p, 24 fig, 9 tab, 102 ref. (Originally published as 'Sputnikova Klimatologiya, Hydrometeorological Press, 1971, Leningrad).

Descriptors: *Climatology, *Remote sensing, *Satellites (Artificial), *Cloud physics, *Data collections, Aerial photography, Infrared radiation, Climatic data, Temperature, Moisture content, Atmosphere, Precipitation (Atmospheric), Snow, Ice cover, Hydrology, Reviews, Analytical techniques, Instrumentation.

The successful functioning of meteorological space systems in the USSR and USA has resulted in a situation where the volume of satellite meteorological information exceeds by far the volume of all the usual meteorological data accumulated during many decades. The gigantic amount of data from satellite meteorological observations and their global nature have introduced the problem of utilizing all these data for climatological investigations. A generalization is made of the problem of the classification of cloudiness on the basis of satellite data and the regularities of the planetary distributions of cloud cover are discussed. The possibilities of working out semiempirical procedures are explored for determining the fields of temperature, moisture content, precipitation, vertical motions, and the distribution of snow and ice covers on the basis of utilizing television and infrared information. This report may be of interest to a broad group of specialists in the area of meteorology and atmospheric physics for space research. A bibliography includes 102 documents. (Woodard-USGS)
W72-13274

DATA FROM CONTROLLED DRILLING PROGRAM IN DU PAGE, KANE, AND KENDALL COUNTIES, ILLINOIS.
Illinois State Geological Survey, Urbana.
For primary bibliographic entry see Field 04B.
W72-13275

SIMULATION MODEL FOR THE UPPER WABASH SURFACE WATER SYSTEM,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
For primary bibliographic entry see Field 04A.
W72-13301

SOME FEATURES IN THE DIURNAL VARIATIONS OF RAIN AND WIND OVER NORTH CAROLINA,
North Carolina Water Resources Research Inst., Raleigh.
For primary bibliographic entry see Field 02B.
W72-13302

PHYSICAL AND HYDROMETEOROLOGICAL CHARACTERISTICS OF THE SNOWY RANGE OBSERVATORY,
Wyoming Univ., Laramie. Water Resources Research Inst.
P. A. Rechard, and V. E. Smith.

Available from the National Technical InformationService as PB-211 618, $3.00 in paper copy, $0.95 in microfiche. Water Resources Series No. 30, June 2972, 168 p. OWRR-A-001-Wyo (56).

Descriptors: Precipitation (Atmospheric), Temperatures, *Solar radiation, *Wind velocity, *Streamflow, Snow, *Wyoming, *Meteorological data, Data collections.
Identifiers: *Snow depth, *Snow density.

Physical and hydrometeorological data from the Snowy Range Observatory are summarized and analyzed. Much of the data came from instrument sites operated and maintained by the Wyoming Water Resources Research Institute, but complementary data observed by the U.S. Geological Survey and the U.S. Soil Conservation Service are included. The kinds of data that are summarized are precipitation, temperature, solar radiation, wind, streamflow, and snow course.
W72-13306

HYDROLOGIC INFORMATION STORAGE AND RETRIEVAL SYSTEM (HISARS) REFERENCE MANUAL,
North Carolina Water Resources Research Inst., Raleigh.
E. H. Wiser.
Available from the National Technical Information Service as PB-211 620, $3.00 in paper copy, $0.95 in microfiche. North Carolina Water Resources Research Institute, Raleigh, Report No. 66, June 1972, UNC-WRRI-72-66, 194 p, 37 fig, 4 append. OWRR-A-045-NC (1).

Descriptors: *Data storage and retrieval, *Hydrologic data, *Climatic data, Information retrieval, *North Carolina, *Publications, *Compute programs, *Basic data collections, Streamflow forecasting, *Data processing.

This manual describes a computerized system for storage, retrieval, and routine processing of hydrologic data. Known as HISARS, the Hydrologic Information Storage and Retrieval System has been under development for several years. Although additional features of the system are planned, the current version will be useful for a larger number of potential users. The Reference Manual was prepared with the intention of making the system more widely available. The system is running on the IBM System/370 Model 165 computer at the Triangle Universities Computation Center, and can be used at any of the remote terminals scattered around the State. Data are stored on magnetic disk packs. By making use of an operating system feature known as the indexed sequential access method together with direct access capabilities of the PL/1 language, HISARS can retrieve any one of approximately 350,000 records directly. This makes it possible to determine weather or streamflow characteristics at any location and at any time for which data are available. It is also possible to compare different locations at the same time and to process records through time at a single location.
W72-13308

COMPILATION TECHNIQUES FOR MEDIUM--SCALE CADASTRAL MAPS ON HILLY TERRAIN,
R. Stalbov.
Sb Uch Zap Aspir Latv Nauchno-Issled Inst Zemled. 1. p 5-17. 1969.
Identifiers: *Mapping, *Crop production, Agriculture, Amelioration, Cadastral, Compilation, Crops, Distribution, Erosion, Hills, Maps, Soils, Structure, Terrain, Soil texture.

A method is proposed for compilation of cadastral maps required by agricultural boards (for the correct distribution of crops, specialization of farms, planning of crop yields, etc.) using large-scale maps. The maps are accompanied by data on the soil textures, relief, erosion by water and deflation, amelioration techniques, soil structure, structure of land utilization, fertilizer requirements and other data facilitating prediction of crop yields and the correct distribution of state purchases of agricultural produce.--Copyright 1972, Biological Abstracts, Inc.
W72-13371

BUMINES DATA PROMISE HELP IN IDENTIFYING PETROLEUM-SPILL SOURCES,
Bureau of Mines, Bartlesville, Okla. Bartlesville Energy Research Center.
For primary bibliographic entry see Field 05A.
W72-13443

CONCEPTUAL ANALYSIS OF RAINFALL AND RUNOFF DATA WITH A HYBRID COMPUTER,
Field Associates, Tucson, Ariz.
For primary bibliographic entry see Field 02A.
W72-13477

GROUND-WATER RESOURCES OF BENSON AND PIERCE COUNTIES, NORTH-CENTRAL NORTH DAKOTA,
Geological Survey, Washington, D.C.
P. G. Randich.
Available from U.S. Geological Survey, Washington, D.C., 20242, for $0.75. Geological Survey Hydrologic Investigations Atlas HA-476, 1972. 1 sheet, 7 fig, 11 ref.

Descriptors: *Groundwater resources, *Water supply, *Water yield, *Water quality, *North Dakota, Aquifer characteristics, Water wells, Water utilization, Maps, Curves, Hydrologic data, Water resources development, Irrigation water, Industrial water, Municipal water, Stock water.
Identifiers: *Benson County (N Dak), *Pierce County (N Dak).

This one-sheet hydrologic atlas provides information concerning groundwater resources in Benson and Pierce Counties, North Dakota for planning the development of water supplies for irrigation, domestic, stock, industrial, and municipal purposes. Groundwater is obtainable both from aquifers in the glacial drift of Quaternary age and in underlying bedrock formations of Cretaceous age. Aquifers of the glacial melt-water deposits generally will yield more than 50 gpm to individual wells and, in places, will yield more than 500 gpm. Three bedrock units of Cretaceous age supply water to wells in Benson and Pierce Counties. These are, in descending order, the Fox Hills Sandstone, Pierre Shale, and Dakota Sandstone. Most of the water from glacial-drift aquifers has a medium to high salinity hazard, but low sodium hazard. Water from the bedrock aquifers generally exceeds the very high salinity and sodium hazards. (Woodard-USGS)
W72-13587

INVESTIGATIONS OF SEAS BORDERING CENTRAL AMERICA (ISSLEDOVANIYA TSENTRAL'NO-AMERIKANSKIKH MOREY).
Institute of Biology of the Southern Seas, Sevastopol (USSR).
For primary bibliographic entry see Field 02L.
W72-13589

INSTRUMENTATION FOR ENGINEERING MANAGEMENT OF A MULTI-PURPOSE RIVER BASIN SYSTEM (THE TRINITY RIVER BASIN, TEXAS),
Texas Univ., Austin. Center for Research in Water Resources.
For primary bibliographic entry see Field 04A.
W72-13609

08. ENGINEERING WORKS

8A. Structures

AN ALGORITHM FOR OBTAINING OPTIMAL LOOPED PIPE DISTRIBUTION NETWORKS,
Parsons, Brinckerhoff, Quade and Douglas, New York. Water Resources Systems Group.
C. A. Kohlhass, and D. E. Mattern.
In: Papers of the 6th Annual Symposium on the Application of Computers to the Problems of Urban Society, Association for Computing Machinery, New York, N.Y., October 29th, 1971, p 138-151. 5 fig, 1 tab, 9 ref.

Descriptors: *Linear programming, *Water distribution systems, Computer models, Mathematical models, Operations research, Systems analysis, Water works, Pipelines.
Identifiers: *Separable non-linear programming, Computer implementation.

The optimization of additions to a municipal water distribution system involves more than efficiency considerations. Such factors as public health and reliability of service must also be considered. A review of the state-of-the-art in water distribution system optimization is made. A new algorithm is defined to enable a linear program to optimize a looped distribution system. Its basis is the specification of minimum sized pipes to meet emergency flow requirements and the specification of flow as the linear programming decision variable. A discussion of the computer implementation of the algorithm includes decomposition of the distribution system, matrix generation, optimization using separable non-linear programming, and report writing. The checking of the optimization of a water distribution simulation model is discussed and typical computer run times are given. Cost savings resulting from application of the model are discussed.
W72-13042

TURBULENT PRESSURE FLUCTUATIONS IN WATER WITH ADDITIVES,
Southampton Univ. (England). Dept. of Aeronautics and Astronautics.
For primary bibliographic entry see Field 0208B.
W72-13047

GEOPHYSICS AND GROUND WATER, PART 2, APPLIED USE OF GEOPHYSICS.

Water Well Journal, Vol 25, No 8, p 35-38. Aug. 1971.

Descriptors: *Drilling, *Seismic studies, *Logging (Recording), Electrical well logging, *Geophysics, Resistivity, Rock properties, Radioactive well logging, Gamma rays, On-site tests.
Identifiers: Drilling rates, *Well logs, Characteristics of rock, Micrologs, Neutron logs, Caliper logs.

The applied use of geophysics in ground water exploration and drilling is described. Electrical resistivity, seismic methods, electrical logging, radioactivity logs, seismic surveys, gravity surveys, use of logs in identification of rock characteristics, and drilling rate interpretation are discussed. (Campbell-NWWA)
W72-13146

DIFFERENTIAL PRESSURE STICKING - LABORATORY STUDIES OF FRICTION BETWEEN STEEL AND MUD FILTER CAKE,
Humble Oil and Refining Co., Houston, Tex.
M. R. Annis, and P. H. Monaghan.
Journal of Petroleum Technology, Vol No 6 p 537-543, May 1962. 7 fig, 1 tab, 12 ref.

Descriptors: *Drilling, *Rotary drilling, Fluid friction, Pressure, *Surfactants, *Drilling fluids.
Identifiers: Quebracho, Ferrochrome lignosulfate, *Filter cake, *Mud cake, *Differential pressure, Drill string, Barite mud, Spotting fluids.

Often during drilling operations the drill string becomes stuck and cannot be raised, lowered, or rotated. One cause is the sticking of the mud column against the filter cake on the hole wall. Experiments were carried out to determine how the sticking friction varied with changes in mud composition and with changes in differential pressure, time of contact of plate and mud cake, and filtercake thickness. The 'sticking' coefficient increased with increasing time of contact between place and mud cake, and with increased barite content of the mud. Quebracho and ferrochrome lignosulfate reduced the sticking coefficient at short set times but did not reduce the maximum value. Carboxymethylcellulose had no effect on the 'sticking' coefficient. Also reducing the sticking coefficient was emulsification of oil in the mud, some oils were more effective than others. Certain surfactants when added to the oils further reduced the sticking coefficient. When a clean fluid was spotted over the stuck place, the 'sticking' coefficient was reduced only if the differential pressure was reduced also. (Campbell-NWWA)
W72-13148

AWWA STANDARD FOR DEEP WELLS.
American Water Works Association, New York.
For primary bibliographic entry see Field 08B.
W72-13150

TUBEWELLS CONSTRUCTION AND MAINTENANCE,
N. Ahmad.
Ripon Printing Press Ltd., Lahore, 1969. 250 p.

Descriptors: *Irrigation wells, Alluvial fans, Alluvium, Arid lands, Freshwater-saline water interfaces, Salts, Well screens, Discharge measurement.
Identifiers: *Coir string, *Tubewells, Strainers, *West Pakistan.

In West Pakistan, a large alluvial plain extending across much of the province stores large supplies of groundwater, which is used for irrigation in a dry climate. The main method for extraction is tubewells. A scientific background for the operation and maintenance of these wells is presented. Included are chapters on the geology and hydrology of the Indus formations: the results of field investigations, and modern scientific methods of exploration; chemical quality of groundwater; techniques of utilization of groundwater; hydraulics of the tubewell; methods for measuring discharge; pumping machinery, and installation methods. (Campbell-NWWA)
W72-13151

SURVEY REVEALS AVERAGES IN DRILLING OPERATIONS.

Ground Water Age, Vol 2, No 5, p 8-9, Jan 1968. 1 fig.

Descriptors: *Drilling, *Surveys, *Water wells, Groundwater.
Identifiers: *Well contractors.

The average water well in the United States was drilled to a depth of 172.3 feet in 1967. Three quarters of all such wells had depths in the 51-200 foot range. 607 replies to a Ground Water Age survey were received from well contractors. The average number of wells drilled per year by each of these respondents was 72, totalling about 45,000 of the approximately half-million wells drilled in 1967. Findings were restricted to drilled wells; those constructed by boring, digging, or the use of well points were not included in the survey. (Campbell-NWWA)
W72-13159

MISSISSIPPI RIVER, EAST BANK, WARREN TO WILKINSON COUNTIES, MISSISSIPPI (NATCHEZ AREA) (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Vicksburg, Miss.

Available from the National Technical Information Service as PB-206 461-D, $3.00 in paper copy, $0.95 in microfiche. December 1, 1971. 40 p, 1 map, 8 tab.

Descriptors: *Mississippi, *Environmental effects, *Flood control, *Flood protection, *Adoption of practices, Pumping plants, Channel improvement, Floodgates, Levees, Weirs, Administrative agencies, Comprehensive planning, Alternative planning, Multiple-purpose projects, Alternative costs, Mississippi River, Project planning, Wildlife habitats, Fisheries, Wetlands.
Identifiers: *Environmental Impact Statements, *Natchez area (Miss).

The project calls for flood control improvements for the Natchez Area (Warren to Wilkinson Counties, Mississippi) consisting of 12.4 miles of levee to protect against the Mississippi River Project Design Flood, a 300-cubic-foot-per-second pumping plant, 12 miles of channel improvements, three 8-foot floodgates with concrete box culverts, and a conservation weir. The project would also provide for the acquisition and development of 2,000 acres of bottomland outside of the leveed area to mitigate project-induced fish and wildlife losses. Environmental impacts include flood protection, improved economic conditions for Adams County, and diminished fish and wildlife productivity within the protected area. Adverse environmental effects include a reduction of wildlife habitat and wildlife productivity, and increased pollution of natural waters and damage to fisheries from expanded and more intensive agricultural uses of protected lands. Alternatives include alternative levee alignments, flood forecasting and warning, flood plain regulation, and permanent evacuation of the flood plain. Attached are comments from several federal and state agencies and a brief economic analysis of the project. (Widman-Florida)
W72-13217

HOW ROTARY SPEED AFFECTS PENETRATION RATE,
Humble Oil and Refining Co., Houston, Tex.
J. R. Eckel, and D. S. Rowley.
Oil and Gas Journal, Vol 55, No 47, p 86-87, Nov. 1957. 5 fig.

Descriptors: *Rotary drilling, Drilling, Test wells, Oil wells.
Identifiers: *Rotary speed, *Penetration rate, Carbide bits, Milled-tooth bits.

A graphic picture is presented of drilling rate versus rotary speed. 36 drilling tests were run on two wells, with rotary speed the only variable, weight and all other functions were held constant. Rotary speed ranged from 20 to 50 RPM with milled tooth bits. Although local formation changes in the test intervals radically influenced the results of any one given test, in general, drilling rate increased with rotary speed, but less than proportionally. The flattening of the rotary speed-penetration rate curve at higher speeds was attributed to less effective tooth contacts at higher speeds for a given bit weight. (Campbell-NWWA)
W72-13230

LABORATORY STUDIES OF THE EFFECT OF ROTARY SPEED ON ROCK-BIT PERFORMANCE AND DRILLING COST,
Hughes Tool Co., Houston, Tex.
R. A. Cunningham.
American Petroleum Institute Drilling and Production Practice p 7-14, 1960. 11 fig, 1 tab, 9 ref.

Descriptors: *Rotary drilling, Drilling equipment.
Identifiers: Turbodrilling, *Optimum rotary speed, *Drilling costs, *Rock-bit performance.

Laboratory data are presented which show relationships between rock-bit bearing life and rotary speed, drilling rate and rotary speed, rock-bit tooth wear and rotary speed. These relationships combine in such a manner as to result in decreased rock-bit footage and increased costs at high rotary speeds. Results giving the optimum rotary speed for constant bit weights, where bearings limit footage per bit, are given. Calculations of lowest costs using the optimum constant rotary speed for a given bitweight are also given, as well as results showing that still lower costs may be obtained by increasing rotary speed as the bit dulls. (Campbell-NWWA)
W72-13231

HOW TO EVALUATE MUD DESANDING,
Loffland Brothers Co., Tulsa, Okla.
R. J. Duran.
Petroleum Engineer, Vol 33, No 9, p 39-44, August 1961. 4 fig, 2 tab.

Descriptors: *Drilling fluids, Rotary drilling, Bentonite, *Mud, *Mississippi.
Identifiers: *Desanding, Mud pumps.

An evaluation procedure to determine exactly how much money desanding saves was developed in a year-long program and tested on a 12,000 ft. well in Mississippi. By applying this procedure, which takes operational aspects also into consideration, $8,112 was saved through use of a desander on the Mississippi well. The saving consisted of $6,420 in mud materials and $1,692 in water costs. Desanding drilling fluid from top to bottom made it possible to carry less mud weight (from 1/2 to 1 lb. per gal. less) than offset wells. Hydraulics were improved, penetration rates were increased, and the hole was well maintained. (Campbell-NWWA)
W72-13232

EFFECT OF MUD PROPERTIES ON DRILLING RATE,
Humble Oil and Refining Co., Houston, Tex.
J. R. Eckel.
American Petroleum Institute Drilling and Production Practice, p 119-125, 1954. 6 ref.

Descriptors: *Drilling fluids, Density, Viscosity, Mud.
Identifiers: Oil-emulsion mud, Filtration rate, *Drilling rate, Circulation rate, *Mud properties, Bit weight, Cutting recovery.

Field observations indicate that the drilling rates obtainable with muds may vary from 30 to 70 percent of those obtainable with water under the same conditions. The causes of this reduction based on laboratory and field experiences are discussed. Fluid viscosity appears to be the significant factor affecting drilling rate through cleaning action. In the field, oil in emulsion muds may improve drilling rate through its lubricating qualities. (Campbell-NWWA)
W72-13233

THE SIGNIFICANCE OF CURRENT PRACTICES IN DRILLING HYDRAULICS,
Reed Roller Bit Co., Houston, Tex.
R. A. Bobo.
Paper presented at Spring meeting, Pacific Coast District Division of Production, American Petroleum Institute, May 1966, Los Angeles, California. 12 p, 7 fig, 1 ref, 2 append.

Descriptors: *Rotary drilling fluids.
Identifiers: *Drilling hydraulics, Hydraulic horsepower, Drilling rate.

The current need in the study of drilling hydraulics is to ascertain those variables, which, when applied at the bit under otherwise optimized conditions, will result in the lowest overall cost per foot of hole drilled. The principles of drilling hydraulics, both those that relate to factors of scavenging at the bit and those that pertain to the control of surface conditions in order to get optimum conditions for scavenging at the bit are described. Volume rate, velocity, hydraulic horsepower, and impact at the bit are discussed, along with required pump horsepower at the surface. (Campbell-NWWA)
W72-13234

TOOLS FOR WELL DEVELOPMENT,
D. C. Ault, and R. H. Bethart.
Water Well Journal, Vol 24, No 3, p 45-47, March 1970.

Descriptors: *Water wells, *Unconsolidated aquifers, *Testing procedures.
Identifiers: *Well development, Surge-blocks, Compressed air, *Jet washing tool, Overpumping, Acid treatment, Backwashing.

Well development equipment is defined as tools which produce an effect on unconsolidated aquifers at or near the borehole to increase the yield of the well. This is accomplished by creating a zone of material around the screen coarser than that of the undisturbed aquifer. This is accomplished by installing a screen (strainer) which has openings large enough to permit 50-65 percent of the formation to enter the well. The equipment used for development is designed to break up the 'bridging effect' of particles which are small enough to pass through the screen. Tools discussed are the solid surge block, compressed air tools, and high velocity jet washing tools. The technique of overpumping , and acid treatment are described. Advantages and disadvantages of each are included. (Campbell-NWWA)
W72-13235

LOST CIRCULATION--A MAJOR PROBLEM IN EXPLORATION AND DEVELOPMENT,
Shell Oil Co., Houston, Tex.
For primary bibliographic entry see Field 08B.
W72-13237

A GRAPHIC VIEW OF PRESSURE SURGES AND LOST CIRCULATION,
Baker Oil Tools, Inc., Los Angeles, Calif.
E. H. Clark, Jr.
American Petroleum Institute Drilling and Production Practice, p 424-438, 1956. 7 ref.

Descriptors: *Drilling fluids, *Circulation, *Rotary drilling.
Identifiers: *Pressure surges, Mud losses.

Pressure surges can be a major factor in lost circulation. When and how these pressure surges take place and the important factors which must be controlled in order to reduce them are discussed. There are very few natural combinations of geostatic and hydrostatic gradients that cannot be successfully drilled, provided: (1) operators are willing to put forth the time and effort required for proper mud control; and, (2) drilling crews can be trained to avoid the practice of running and pulling pipe in a fast and rough manner. (Campbell-NWWA)
W72-13238

ENGINEERING DESIGN OF DRILLING OPERATIONS,
Tenneco Oil Co., Houston, Tex.
J. A. Edwards.
American Petroleum Institute Drilling and Production Practice, p 39-55, 1964. 20 fig, 3 tab, 17 ref, append.

Descriptors: *Drilling, Economics, *Rotary drilling, *Design, *Operating costs.
Identifiers: *Drilling costs, Penetration rate, Big weight, Rotary speed, Tooth wear, Bottom hole horsepower, Crooked-hole problems.

The purpose is to enable the drill operator or engineer to select the design parameters of his drilling operation which would give the best drilling rate at the lowest cost. Every quantity in a drilling operation can be varied, except the formation character. Explored are effects of weight and RPM on drilling rate, effects of weight and RPM on tooth wear, effects of tooth wear on drilling rate, effects of weight and RPM on bearing wear, and hydraulic horsepower versus penetration rate. The trip-time of the rig at various depths, another time-cost factor is discussed. (Campbell-NWWA)
W72-13239

CONSTANT ROTARY SPEED AND VARIABLE WEIGHT FOR REDUCING DRILLING COST,
Pan American Petroleum Corp., Liberal, Kans.
S. A. Billington, and K. A. Blenkarn.
American Petroleum Institute Drilling and Production Practice, p 52-63, 1962. 5 fig, 1 ref, 2 append.

Descriptors: *Drilling, *Rotary drilling, *Operating costs.
Identifiers: *Rotary speed, *Bit weight, Optimizing systems, Bit wear, *Drilling costs.

Theoretical charts are presented for use in calculating the optimum constant-speed and variable-weight program to be followed during a bit run to obtain minimum drilling cost. Field tests have been conducted with this calculating system, which may be used on rigs with fixed-speed rotary drives; and other tests with a similar variable-weight and variable-speed system. Results show that both systems lead to 12 to 51 percent reductions in calculated direct drilling cost as compared to conventional drilling. (Campbell-NWWA)
W72-13240

MICROBIT STUDIES OF THE EFFECT OF FLUID PROPERTIES AND HYDRAULICS ON DRILLING RATE,
Esso Production Research Co., Houston, Tex.
J. R. Eckel.
Journal of Petroleum Technology, Vol 240, p 541-546, 1967. 13 fig.

Descriptors: *Drilling fluids, *Rotary drilling, Reynolds number.
Identifiers: *Microbits, Kinematic viscosity, *Drilling rates.

Mud properties affect drilling rate. Drilling with water is as much as six to seven times faster than with mud. It is not known why drilling rates with mud are lower. Recent studies show what fluid properties govern microbit drilling rate and also provide a quantitative correlation of these fluid properties and hydraulics with microbit drilling rate. Tests showed that (1) drilling rate in a given system with constant circulating rate and nozzle velocity is a function of the kinematic viscosity of the drilling fluid measured at near bit nozzle shear rates; (2) the combined effect of fluid properties and hydraulics on microbit drilling rate is defined by a Reynolds number function; (3) for the same kinematic viscosity, drilling rate is independent of solids content; (4) for the same kinematic viscosity, drilling rate is independent of fluid loss. (Campbell-NWWA)
W72-13242

EFFECT OF PRESSURE ON ROCK DRILLABILITY,
Humble Oil and Refining Co., Houston, Tex.
J. R. Eckel.
Transactions, Society of Petroleum Engineers of AIME, Vol 213, p 1-6, 1958. 23 fig, 2 ref.

Descriptors: *Rotary drilling, Hydrostatic pressure, Drilling fluids, Limestone.
Identifiers: *Formation pore pressure, Terrastatic pressure, Microbits, Air drilling, Bit weight.

A laboratory drilling rig was devised and placed in operation which permits the application of hydrostatic, terrastatic, and formation pore pressures to a rock sample for drilling under controlled conditions. Tests under pressure, using water and air as the drilling fluids, indicate that when drilling saturated limestone samples, a pressure differential between hydrostatic and formation pressure is the only pressure which affects drilling rate. A differential in either direction causes a reduction in drilling rate, but the same differential from the wellbore into the formation causes the greater reduction. In general, the magnitude of the changes due to the pressure effect were small compared to changes in drilling rate obtainable by changing either bit weight or rotary speed. (Campbell-NWWA)
W72-13243

LABORATORY STUDY OF EFFECT OF OVERBURDEN, FORMATION AND MUD COLUMN PRESSURES ON DRILLING RATE OF PERMEABLE FORMATIONS,
Hughes Tool Co., Houston, Tex.
R. A. Cunningham, and J. G. Eenink.
Transactions, Society of Petroleum Engineers of AIME, Vol 217, p 9-17, 1958. 14 fig, 10 ref.

Descriptors: *Rotary drilling, *Drilling fluids, Overburden, Sandstone, Limestone.
Identifiers: *Mud column pressure, *Formation pressure, *Drilling rates, *Permeable formations.

One phase has been completed of a laboratory investigation of formations with relatively high permeability under conditions of over-burden, formation, and mud column pressures. Drilling rate decreased when mud column pressure was greater than formation pressure. The decrease was primarily due to a layer of cuttings and mud particles held to the hole bottom by the difference in pressure. Adequate jet velocities helped clean away the filter cake and chips and resulted in increased drilling rate--the higher the jet velocity, the faster the drilling rate. Drilling rate increased slightly when formation pressure was greater than mud column pressure. Overburden pressure had practically no effect on drilling rate. (Campbell-NWWA)
W72-13244

DESIGN OF PVC WATER-DISTRIBUTION PIPE,
Johns-Manville Research and Engineering Center, Manville, N.J. Fluids Handling Dept.
R. T. Hucks, Jr.
Civil Engineering, ASCE, Vol 42, No 6, p 70-73, June 1972. 6 fig.

Descriptors: *Water supply, *Distribution systems, *Design, Water hammer, Pipes, Corrosion control, Water pollution control.
Identifiers: *Polyvinyl chloride pipe.

Polyvinyl chloride pipe is inert to the chemical actions of natural waters and soils. This study determined that PVC pipe design is adequate for water-distribution systems. PVC pipe can withstand occasional high pressure surges under static pressure. It can resist surges in pressure to a degree that depends on the number of surges and their magnitude (cyclic pressure). Crushing does not appreciably affect hydrostatic strength of PVC pipe. Three studies of operating systems further verified the experimental results. Present design methods for PVC pipe are reviewed. (Bean-AWWARF)
W72-13255

CALIFORNIA WATER PROJECT,
California State Dept. of Water Resources, Sacramento.

For primary bibliographic entry see Field 04A.
W72-13259

A COASTAL POLLUTION PROBLEM AND ITS SOLUTION - THE DESIGN AND CONSTRUCTION OF A SUBMARINE SEWER OUTFALL AT EASTBOURNE,
For primary bibliographic entry see Field 05D.
W72-13485

8B. Hydraulics

CAVITATION TESTS ON BAFFLE PIERS AND BUCKET SPLITTERS OF SPILLWAY HYDRAULIC STRUCTURES,
Vsesoyuznyi Nauchno-Issledovatelskii Institut Gidrotekhniki i Melioratsii, Moscow (USSR).
N. P. Rozanov, R. M. Razakov, and A. T. Kaveshnikov.
Proceedings, 14th Congress of the International Association for Hydraulics Research, Vol 5, Paris, France, p 57-60, Aug-Sept 1971. 5 fig, 4 ref.

Descriptors: *Cavitation, Baffles, Hydraulic structures, Laboratory tests, Fluid mechanics, Hydraulic jump, Hydraulic models, Test procedures, Erosion, Energy dissipators, Stilling basins.
Identifiers: *Cavitation parameters, *Baffle blocks, *Cavitation control, *Baffle piers, *Vacuum apparatus, Experimental models, Cavitation index, USSR, Test results.

Cavitation failures often occur during operation of hydraulic structures. Many of these failures occur at relatively low flow velocities. Much interest has been generated in cavitation prediction and erosion in baffle piers and bucket splitters. As a result, engineers found that the simple conventional procedure of incipient cavitation prediction based upon vacuum measurement with transducers is unreliable and leads to underestimation of cavitation danger. Serious errors can result when the transducers are not placed in exactly the maximum vacuum zone. Results obtained from cavitation tests in vacuum tanks are more reliable. Basic experiments on cavitation were so made. Various shapes of baffle piers were mounted on an apron and subjected to a hydraulic jump. The inception and development of cavitation were investigated by an ultrasonic transducer. Visual observations of the cavitation zone were made with stroboscopic light. Critical cavitation parameters obtained by the ultrasonic method coincided with those obtained by visual observation of the moment of cavitation inception. Air injection into the zone of maximum vacuum was the most effective method for improving cavitation characteristics of the piers investigated. (USBR)
W72-13120

THE VERTICAL SLOT AS A FLOW MEASUREMENT DEVICE,
Waterloo Univ. (Ontario); and Ontario Water Resources Commission, Toronto.
For primary bibliographic entry see Field 07B.
W72-13129

WATER SYSTEM AND TREATMENT HANDBOOK.

Water Systems Council, Chicago, 1966, fourth ed. 108 p.

Descriptors: Groundwater, Water wells, *Water supply development, *Pumps, Electric motors, Treatment facilities, Water treatment.
Identifiers: *Submersible pumps, *Jet pumps, *Reciprocating pumps, Pressure tanks.

It is estimated that 95 percent of all freshwater available in the nation at any time is groundwater. Systems which are used to tap this resource, along with insuring its chemical and biological purity are discussed. The general aspects of well construction, operation and installation of jet, submersible, and positive displacement pumps, service for these pumps, well sanitation, distribution equipment, air controls, electric motors, and treatment of domestic water are described. (Campbell-NWWA)
W72-13147

DIFFERENTIAL PRESSURE STICKING - LABORATORY STUDIES OF FRICTION BETWEEN STEEL AND MUD FILTER CAKE,
Humble Oil and Refining Co., Houston, Tex.
For primary bibliographic entry see Field 08A.
W72-13148

AWWA STANDARD FOR DEEP WELLS.
American Water Works Association, New York.

American Water Works Association, Standard AWWA A 100-66, Revised Edition, 1966. 57 p.

Descriptors: *Water wells, *Standards, Construction materials, Contracts, Testing procedures, Grouting, Disinfection, Chlorination.
Identifiers: Permits, *Methods, Equipment, Plumbness, Unit price method, Lump sum method, Guaranteed yield method, Gravel packing, Drive shoes.

A guide in the preparation of contract documents governing well construction is provided. Discussed are the nature of the work; permits, certificates, laws, and ordinances; and other legal aspects of well contracting. Standards of construction and maintenance are defined for well casings, screens, testing for yield, grouting, plumbness and alignment, and disinfection. (Campbell-NWWA)
W72-13150

TUBEWELLS CONSTRUCTION AND MAINTENANCE,
For primary bibliographic entry see Field 08A.
W72-13151

JET DEVELOPMENT DOES THE WORK.

Johnson National Drillers Journal, Vol 33, No 6, p 1-4, Nov-Dec 1961. 3 fig, 1 tab.

Descriptors: *Water wells, *Screens, Drilling, Unconsolidated aquifers.
Identifiers: Pumping rate, *Jetting, Washing, *Well development, Flushing, Slot size.

Jetting can be thought of as a special scheme for backwashing and developing a well. A relatively simple jetting tool together with a high pressure pump and the necessary hose and piping are the principal items of equipment needed. The forceful action of high velocity jets working through the screen openings agitates and rearranges the sand and gravel particles of the formation surrounding the screen. The jet is designed so that the water slows under pressure horizontally through the screen openings; by rotating, raising and lowering the jetting tool, full coverage is achieved. 65 percent increase in yield was obtained by the jetting method. Methods of installation and techniques of operation are described. Tables of discharge and velocity as related to nozzle orifice size are presented. (Campbell-NWWA)
W72-13153

A NOTE ON THE MEASUREMENT OF PLANAR VELOCITY FIELDS BY STEREO-PHOTOGRAMMETRY,
Southampton Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 02E.
W72-13200

RANDOM WALK MODEL FOR MOTION OF A SOLID PARTICLE IN TURBULENT OPEN-CHANNEL FLOW,
Technical Univ. of Istanbul (Turkey). Dept. of Hydraulic and Water Power.
For primary bibliographic entry see Field 02J.
W72-13201

SOME ASPECTS OF ANALYZING TRANSVERSE DIFFUSION IN RIVERS,
Illinois Univ., Urbana. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02E.
W72-13202

LOST CIRCULATION--A MAJOR PROBLEM IN EXPLORATION AND DEVELOPMENT,
Shell Oil Co., Houston, Tex.
J. M. Bugbee.
American Petroleum Institute Drilling and Production Practice, p 14-27. 1953.

Descriptors: *Drilling fluids, *Rotary drilling, *Circulation, Limestones.
Identifiers: *Formation damage, *Lost zones, *Mud losses.

The major drilling problem of lost circulation can be avoided or minimized by the study of possible losses and the programming of treating procedures in advance of drilling. Not only must there be openings in the formation of sufficient size to accept and store the lost mud, but excessive pressures must act to force it away. The nature of loss zones, their formation-fluid pressures and the hydrostatic and mechanical pressures that can be imposed are explored. (Campbell-NWWA)
W72-13237

A GRAPHIC VIEW OF PRESSURE SURGES AND LOST CIRCULATION,
Baker Oil Tools, Inc., Los Angeles, Calif.
For primary bibliographic entry see Field 08A.
W72-13238

MIXING OF MERGING BUOYANT JETS FROM A MANIFOLD IN STAGNANT RECEIVING WATER OF UNIFORM DENSITY,
California Univ., Berkeley. Hydraulic Engineering Lab.
For primary bibliographic entry see Field 05B.
W72-13312

IDENTIFICATION OF PARAMETERS IN UNSTEADY OPEN CHANNEL FLOWS,
California Univ., Los Angeles. Dept. of Engineering Systems.
For primary bibliographic entry see Field 02E.
W72-13476

EROSION OF SAND BEDS AROUND SPUR DIKES,
Ministry of Natural Resources, Sokoto (Nigeria).
For primary bibliographic entry see Field 02J.
W72-13572

MEASUREMENT OF VELOCITY-CONCENTRATION COVARIANCE,
Geological Survey, Bay St. Louis, Miss.
For primary bibliographic entry see Field 05B.
W72-13574

CONTROL OF SEDIMENT IN CANALS.
For primary bibliographic entry see Field 04D.
W72-13576

HELE-SHAW MODEL OF LONG ISLAND AQUIFER SYSTEM,
Southern Methodist Univ., Dallas, Tex. Inst. of Tech.
For primary bibliographic entry see Field 02F.

W72-13578

8C. Hydraulic Machinery

THE ECONOMICS OF GEOTHERMAL POWER,
For primary bibliographic entry see Field 06C.
W72-13092

AMERICAN STANDARD FOR VERTICAL TURBINE PUMPS.
American Water Works Association, New York.

American Water Works Association, Standard AWWA E 101-61, 1961, revised ed. 49 p.

Descriptors: *Water wells, *Pump turbines, *Pumps, *Standards.
Identifiers: *Vertical turbine pumps, *Line shaft pumps, *Submersible pumps.

A guide is provided for users of vertical turbine pumps in selecting new equipment. Both the line shaft and the submersible types of vertical turbine pumps are discussed, with complete specification standards for each. The suggested standards are to be considered a minimum requirement for first-quality vertical turbine pumps. Definitions of each type of pump, with nomenclature, general specifications, engineering data, and factory inspection and tests for each are included. (Campbell-NWWA)
W72-13149

JET DEVELOPMENT DOES THE WORK.
For primary bibliographic entry see Field 08B.
W72-13153

DESALTING,
National Water Commission, Arlington, Va. Engineering and Environmental Div.
For primary bibliographic entry see Field 03A.
W72-13354

8E. Rock Mechanics and Geology

COMPUTER SIMULATION OF SECOND ORDER FAULTS,
Karlsruhe Univ. (West Germany).
H. Bock.
Rock Mechanics, Vol 3, No 4, p 225-238, Dec. 1971. 11 fig, 1 tab, 16 ref.

Descriptors: *Finite element analysis, *Faults (Geologic), Mathematical models, *Fractures (Geologic), Rock mechanics, Simulation, Stress analysis, Computer models, Mohr failure theory, Rock foundations, Structural geology, Deformation, Bibliographies, Sliding, Shear cracks.
Identifiers: *Crack propagation, Germany, Iteration method, Shear planes, Discontinuities, Stress distribution.

A finite element model simulates complex rock fracture patterns. These fracture patterns include second order faults--faults which branch off from a principal fault. Principal shortcomings of previous methods were: (1) stress rearrangements along the principal fault surface during sliding were not considered; and (2) the rock materials and discontinuity properties were not entirely correct. To overcome these problems, the finite element model uses an iterative process to transfer the stress of an overloaded element to neighboring elements. The strength properties of the rock material and the discontinuities are defined using Mohr criteria. The finite element method indicates that stress rearrangements occur during shear movement along the principal fault, contributing to the development of new second order faults. (USBR)
W72-13128

GEOPHYSICS AND GROUND WATER, PART 2, APPLIED USE OF GEOPHYSICS.
For primary bibliographic entry see Field 08A.
W72-13146

SHALE ALTERATION BY WATER ADSORPTION,
Esso Production Research Co., Houston, Tex.
M. E. Chenevert.
Journal of Petroleum Technology, p 1141-1148, Sept. 1970. 14 fig, 4 tab, 14 ref.

Descriptors: *Shales, *Adsorption, *Hydration, *Montmorillonite shale, *Illite shale.
Identifiers: Shale adsorptive potential, *Hydrational strain, *Hydrational stress, Hydrational rupture, Yield stress, Triaxial tester, *Chloritic shale.

The purpose was to observe the behavior and measure the properties of a broad range of shale types - montmorillonitic, illitic and chloritic - when exposed to water. An adsorptional isotherm technique makes it possible to define quantitatively the hydrational tendencies of any formation, thereby eliminating the cumbersome rock classification schemes presently used in industry. All types of shales tested were reactive to fresh water. Montmorillonitic shales, not unexpectedly, evidenced alteration of properties as a result of water adsorption. (Campbell-NWWA)
W72-13241

EFFECT OF PRESSURE ON ROCK DRILLABILITY,
Humble Oil and Refining Co., Houston, Tex.
For primary bibliographic entry see Field 08A.
W72-13243

8F. Concrete

DISTRIBUTED LOADS CREATING COMBINED TORSION, BENDING, AND SHEAR ON L--BEAMS WITH STIRRUPS,
Mullen and Powell, Inc., Dallas, Tex.; and Texas Univ., Austin.
K. S. Rajagopalan, and P. M. Ferguson.
Journal of the American Concrete Institute, Proceedings, Vol 69, No 1, p 46-54, Jan 1972. 10 fig, 2 tab, 8 ref.

Descriptors: *Beams (Structural), *Reinforced concrete, *Loads (Forces), Shear, Stiffness, Safety factors, Test procedures, Shear stress, Reinforcing steel cracks, Stress.
Identifiers: *Flexural strength, Concentrated loading, Uniform loading, T-beams, Stirrups, Twisting stress, Test results, Stress distribution, Eccentric loading, Torsion, Ultimate loads, Bending stress.

The extent of additional safety associated with distributed, as compared to point loads, on reinforced concrete beams with stirrups was explored. The investigation was restricted to L-beams which are most subject to torsion. Tests on semicontinuous L-beams with stirrups, under distributed loads creating torsion combined with flexure and shear, showed about 25% greater load capacities than similar beams under point loads. In this evaluation, shears and torques were taken at a distance d from the support. Despite a negative moment yield line in the slab at the face of web, the flange appeared to be effective in resisting the torsion. The post-cracking torsional stiffness dropped to from 3 to 7% of the initial stiffness. Strain gage measurements at the point of inflection showed steel stress from torsion varying more nearly with the twist angle than with torque. (USBR)
W72-13117

REINFORCED CONCRETE EXTERIOR BEAM--COLUMN JOINTS UNDER SEISMIC LOADING,
Ministry of Works, Wellington (New Zealand); and Canterbury Univ., Christchurch (New Zealand).
L. M. Megget, and R. Park.
New Zealand Engineering, Vol 26, No 11, p 341-353, Nov 1971. 14 fig, 4 tab, 16 ref, append.

Descriptors: *Reinforced concrete, *Joints (Connections), Seismic studies, Building codes, Design practices, Test procedures, Instrumentation, Shear, Shear forces, Cracks, Bibliographies.
Identifiers: *Beam columns, *Seismic tests, *Earth-resistant structures, Seismic regime, Plastic hinges, New Zealand, Crack propagation, Stress-strain curves, Test results.

Described is an experimental investigation into the behavior of exterior beam-column joints of reinforced concrete frames with low axial load. Three beam-column test units, each designed by different methods, were tested and results compared. Each beam-column was subjected to the same program of static cyclic loading. The design parameters examined were the methods of anchoring the longitudinal beam reinforcement within the column and the amount of transverse shear reinforcement within the joint region. The joints of all 3 specimens proved to be inadequately reinforced to resist the large joint shears present under intense seismic loading conditions in the inelastic range. (USBR)
W72-13119

RECOMMENDATIONS FOR ESTIMATION OF QUALITY OF CONCRETE IN FINISHED STRUCTURES,
Cement- Och Betonginstitutet, Stockholm (Sweden).
N. Petersons.
Materials and Structures, Vol 4, No 24, p 379-397, Nov-Dec 1971. 11 fig, 6 tab, 55 ref, append.

Descriptors: *Concrete technology, *Concrete properties, *Concrete testing, *Core drilling, Concrete structures, Test specimens, Chemical analysis, Dynamic tests, Ultrasonic tests, Structural behavior, Test procedures, Bibliographies.
Identifiers: *Quality levels, Sweden, *Concrete properties, Structural concrete.

Recommendations for estimating the quality of concrete in finished structures are presented. These recommendations are to be regarded as a guide only and not a standard or a code of practice. The term quality is primarily used to designate the strength of concrete, but may also be used to denote other properties, such as cement content, air content, and porosity. The strength level of the concrete in a structure should be determined on the basis of results from tests on core cylinders drilled, or cubes sawn from the structure. The scope of the investigation required in estimating the quality of concrete in a given structure is dependent upon the reasons for the investigation. Strength level is a decisive factor in determining the quality of concrete, and many other properties of concrete can be related to strength. Discussed are: (1) methods of testing, (2) sampling procedures, (3) number of test specimens required, (4) location of sampling area, (5) effect of core drilling on behavior of the structure, (6) evaluation of compression tests, (7) analysis of results from other tests, and (8) estimation of quality level. (USBR)
W72-13121

MOMENTS IN BEAM SUPPORTED SLABS,
Illinois Univ., Urbana.
W. L. Gamble.
Journal of the American Concrete Institute, Proceedings, Vol 69, No 3, p 149-157, Mar 1972. 9 fig, 15 ref, append.

Descriptors: *Slabs, *Beams (Structural), *Reinforced concrete, *Concrete structures, Moments, Columns, Structural analysis, Structural concrete, Panels, Analysis, Bibliographies.
Identifiers: *Concrete slabs, *Floors, *Moment distribution, *Bending moments, Stiffness.

Charts are presented showing the theoretical distribution of elastic moments in interior panels as a function of the slab stiffness in relation to the beam stiffness. Previous design methods for beam-supported slabs assumed that the slabs were on rigid beams. A beam stiffness parameter, alpha, was used to relate the stiffness of the beam to the stiffness of the width of the slab supported by the beam. Results show that for a large portion of slabs supported by beams on all 4 sides, the value of alpha will exceed 2, resulting in moment distributions relatively insensitive to further increases in beam stiffness. These results pertain to the panels under uniformly distributed loads. Moments in panels at the edge of a structure were not investigated. The influence of the supporting column size on the bending moment distribution is considered. (USBR)
W72-13124

SEEPAGE THROUGH SOIL-CEMENT FACINGS,
Bureau of Reclamation, Denver, Colo.
G. DeGroot.
Paper, American Society of Civil Engineers, Conference on Performance of Earth and Earth-Supported Structures, Purdue Univ., Lafayette, Ind. June 1972. 16 p, 9 fig, 7 ref, append.

Descriptors: *Soil cement, *Permeability, *Seepage, Field tests, Cost savings, Bonding, Shrinkage, Cracks, Test procedures, Construction materials, Algae, Laboratory tests, Thermal expansion, Slope protection, Dam design, Permeability coefficients.
Identifiers: Lubbock Regulating Reservoir (Tex), Canadian River Aqueduct (Tex), Test results, Seepage losses, Dam facings, Field permeability tests, Seasonal variations.

Seepage through 2 soil-cement test sections constructed at Lubbock Regulating Reservoir indicated that soil-cement permeability ranged from semipervious to impervious. Each test section, composed of 12% cement mixed with silty sand, was about 1,200 ft sq and 2.54 ft thick. The seepage water flowed into a layer of pervious sand and then drained into a collection tank. Calculated seepage rates varied from as high as 0.15 ft/day initially, to an average of 0.005 ft/day in warm months, and about 0.04 ft/day in colder months. These rates were somewhat greater than the rate from a standard laboratory test, indicating that considerable seepage flowed through shrinkage cracks and construction contact planes between layers. The decrease in seepage rates following the higher initial rates indicates the soil-cement tends to seal during use. Decreases in flow during the warm months were attributed to thermal expansion, which reduced crack widths. (USBR)
W72-13126

CARBON FIBRE REINFORCEMENT OF CEMENT,
Building Research Station, Watford (England).
M. A. Ali, A. J. Majumdar, and D. L. Rayment.
Cement and Concrete Research, Vol 2, No 2, p 201-212, Mar 1972. 3 fig, 4 tab, 5 ref.

Descriptors: *Concrete technology, *Fibers, Reinforcement, Physical properties, Laboratory tests, Reinforced concrete, Asbestos cement, Tensile strength, Impact tests, Carbon, Cements, Strength, Durability, Corrosion.
Identifiers: *Carbon fibers, *Reinforcing materials, Great Britain, Composite materials, Modulus of elasticity, Rupture modulus, Stress-strain curves.

Because of chemical inertness at ambient temperatures, carbon fibers are used to reinforce reactive matrices, such as cement, despite high costs. These fibers have very high strength and elastic modulus; therefore, only a small volume of fiber is required for producing composites having strengths similar to those of commercial asbestos-cement sheets. A 3% by volume addition of the high-modulus carbon fiber to cement results in a 2-fold increase in the modulus of elasticity and a 5-fold increase in the tensile strength over the values of the unreinforced matrix. Carbon fibers also increased the cracking strain observed in tensile tests. Results of durability tests of samples continuously stores in 50 deg C water indicated the carbon reinforced fiber specimens had higher moduli of rupture than asbestos-cement specimens; no significant improvement in impact strength was observed. (USBR)
W72-13131

VARIABILITY OF DEFLECTIONS OF SIMPLY SUPPORTED REINFORCED CONCRETE BEAMS.
American Concrete Inst., Detroit, Mich. Committee 435.

Journal of the American Concrete Institute, Proceedings, Vol 69, No 1, p 29-35, Jan 1972. 10 fig, 1 tab, 5 ref.

Descriptors: *Reinforced concrete, *Beams (Structural), *Deflection, *Design standards, Variability, Loads (Forces), Probability, Structural design, Structural behavior, Probability theory, Histograms, Building codes.
Identifiers: Deflection measurement, American Concrete Institute, Camber.

The variability of measured deflection of simply supported reinforced concrete beams compared to deflection calculated by accepted methods is discussed. The probability of the deflection of a particular beam falling within a given level of uncertainty is evaluated by analyzing existing data and fitting a probability distribution to the data. Using the criteria of ACI 318-71, the deflections of a particular beam have approximately a 90% possibility of being within the range of 20% less than, to 30% more than, the calculated value, a slight improvement over ACI 318-63. Figures for the 90% interval based on ACI 318-63 are 30% less than and 30% greater than the calculated value. Tables are given to evaluate the minimum expected variability of calculated deflections using either ACI 318-63 or ACI 318-71. (USBR)
W72-13133

8G. Materials

INVESTIGATION OF METALLIDE COATINGS FOR SEAWATER PUMP COMPONENTS,
Little (Arthur D), Inc., Cambridge, Mass.
J. L. O'Brien.
Report available for sale by Superintendent of Documents, U. S. Government Printing Office, Washington, D.C. 20402 - Price $0.50. Office of Saline Water Research and Development Progress Report No 716, September 1971. 43 p, 29 fig, 3 ref. OSW Contract 14-30-2638.

Descriptors: *Desalination, *Pumps, *Cavitation, Metallurgy, *Alloys, *Corrosion control, *Coatings, *Protective coatings.
Identifiers: *Diffusion coatings, Beryllides, Borides, Chromides, *Seawater pumps.

This report describes an exploratory investigation on the use of diffusion coatings to improve the erosion resistance of materials. Primary applications for the coatings would be in seawater pumps. Although expensive alloys exist which have good erosion resistance, the hope in this program was to develop a coating-substrate combination which would have good erosion resistance and be cheaper than these alloys. With the proper coating, a low-cost substrate could be upgraded so that its erosion resistance becomes comparable to that of the expensive alloys. Diffusion coatings were applied using the molten salt electrolytic process developed by the General Electric Company. Erosion testing was done using an ultrasonic horn which causes cavitation in the test liquid. Specimens under test were attached to the tip of the horn and immersed in seawater, the test liquid. Diffusion coatings tested included: beryllium into copper, 90-10 copper nickel, 70-30 copper nickel, monel, nickel, copper-6% aluminum and 1018 steel; boron into 1018 steel, 4340 steel, nickel electrodeposited on 1018 steel, nickel, and molybdenum sprayed on 1018 steel; and chromium into 1018 steel, 4340 steel. Of the diffusion coating-substrate combinations, those with highest erosion-corrosion resistance were beryllium diffused into the copper-based alloys. The erosion-corrosion resistance of the beryllide coatings on these alloys was comparable to Inconel 718 and considerably better than 316 stainless steel. (OSW abstract)
W72-13141

8I. Fisheries Engineering

MIGRATION RESPONSE OF JUVENILE CHINOOK SALMON TO SUBSTRATES AND TEMPERATURES,
Idaho Univ., Moscow. Water Resources Research Inst.
For primary bibliographic entry see Field 02I.
W72-13293

OXYGEN LEVEL EVALUATION AT SOME SALMONID FISH HATCHERIES,
J. Wieniawski.
Rocz Nauk Roln Ser H Rybactwo, Vol 93, No 3, p 83-108, 1971, Illus.
Identifiers: *Fish physiology, Hatcheries, *Oxygen requirements, *Salmonids, *Trout.

O2 consumption measurements were taken in the fattening ponds of 8 French trout hatcheries. A direct relationship between O2 consumption and the weight gained by the fish was observed but no difference was noted as a function of the water temperature (within a limit of 11 to 18C). According to the literature and personal observations, variations in the activity of the fish influenced O2 consumption more than temperature differences.--Copyright 1972, Biological Abstracts, Inc.
W72-13414

THE RELATIONSHIP BETWEEN TROUT RAISING SUCCESS, ENVIRONMENT AND RAISING TECHNIQUE FACTORS,
Instytut Rybactwa Srodladowego, Warsaw (Poland). Dept. of River Fishery.
J. Wieniawski.
Rocz Nauk Roln Ser H Rybactwo. Vol 93, No 2, p 95-120. 1971. Illus.
Identifiers: Fish diets, *Fish hatcheries, *Fish management, Environment, Mortality, Temperature, *Trout.

The relationship between trout raising success, environment, and raising technique factors was investigated at 11 salmonid hatcheries in France that varied as to their natural conditions and raising techniques. Except for the influence of temperature, no dependance between raising success and natural environmental factors (CO2, pH, water hardness) was noted with regard to the tolerance of the rainbow trout. A correlation was, however, noted between the raising success and raising technique factors (sanitary conditions, production organization, amount of handling of the fish, population density in the raising ponds). Raising success was most influenced by fish mortality and by dietary efficacy.--Copyright 1972, Biological Abstracts, Inc.

W72-13425

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Iowa Univ., Iowa City.
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W72-13055

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For primary bibliographic entry see Field 02H.
W72-13481

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For primary bibliographic entry see Field 02H.
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INSTANCES, IF ANY, WHERE COST/BENEFIT ANALYSIS HAS BEEN APPLIED TO ENVIRONMENTAL PROBLEMS, UNITED STATES.
National Air Pollution Control Administration, Washington, D.C.
For primary bibliographic entry see Field 06B.
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10F. Preparation of Reviews

A REVIEW OF AUTECOLOGICAL AND SAPROBIOLOGICAL DATA ON FRESHWATER CILIATES, (EINE ZUSAMMENSTELLUNG VON AUTOKOLOGISCHEN UND SAPROBIOLOGISCHEN BEFUNDEN AN SUSSWASSERCILIATEN),
Bonn Univ. (West Germany). Zoological Inst.
For primary bibliographic entry see Field 05C.
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C. Other		
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Ocean Engineering Information Service	W72-13520 -- 13547	28
Office of Saline Water	W72-13141	1

CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Water Resources Division of the U. S. Geological Survey, U. S. Department of the Interior.
- Metropolitan water resources management at the Center for Urban Studies of the University of Chicago.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Design and construction of hydraulic structures; weather modification; and evaporation control at the Bureau of Reclamation. Denver, Colorado.
- Eutrophication at the Water Resources Center of the University of Wisconsin, jointly sponsored by the Soap and Detergent Association and the Agricultural Research Service.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Public water supply treatment technology at the American Water Works Association.

Supported by the Environmental Protection Agency in cooperation with WRSIC.

- Thermal pollution at the Department of Sanitary and Water Resources Engineering of Vanderbilt University.
- Water quality requirements for freshwater and marine organisms at the College of Fisheries of the University of Washington.
- Wastewater treatment and management at the Center for Research in Water Resources of the University of Texas.
- Agricultural livestock wastes at the Department of Agricultural Engineering of Iowa State University.
- Methods for chemical and biological identification and measurement of pollutants at the Analytical Quality Control Laboratory of the Environmental Protection Agenc
- Coastal pollution at the Oceanic Research Institute.
- Water treatment plant waste pollution control at American Water Works Association.
- Effect on water quality of irrigation return flows, at the Department of Agricultural Engineering of Colorado State University.

Subject Fields

1 NATURE OF WATER

2 WATER CYCLE

3 WATER SUPPLY AUGMENTATION AND CONSERVATION

4 WATER QUANTITY MANAGEMENT AND CONTROL

5 WATER QUALITY MANAGEMENT AND PROTECTION

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